IMPERIAL MYCOLOGICAL INSTITUTE

# REVIEW

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COOK (H. T.) & CALLENBACH (J. A.). **Spinach seed treatment.**—*Bull. Va Truck Exp. Sta.* 87, pp. 1213–1233, 2 figs., 1 graph, 1935.

After briefly referring to the considerable economic importance of damping-off (most of which is apparently caused by a species of *Pythium*) of spinach in south-east Virginia [cf. *R.A.M.*, xiii, p. 5], the authors give a tabulated account of greenhouse and field experiments in 1932 and 1934 to determine the relative value for seed treatment of red [cuprous] oxide of copper [ibid., xiv, p. 382], zinc oxide, zinc hydroxide, semesan, vasco 4 (a proprietary preparation manufactured by the Virginia Smelting Company containing zinc oxide and zinc hydroxide), and copper sulphate solution (1 lb. in 8 galls. water). In early autumn sowings all the treatments gave substantial increases in stands and yields, the best results being obtained with vasco 4 and zinc hydroxide. In later autumn sowings little or no benefit resulted from treatment with the zinc compounds, and copper sulphate always caused a reduction in stand. Red copper oxide caused no injury in the later sowing in 1932, when the weather was wet, but was injurious in 1934 when the late autumn was dry.

All the dusts (except semesan) were used at the standard rate of 2 per cent. of the seed by weight, and special tests indicated that increasing the dose of the dusts did not result in significant increase in yield of the crop. There was evidence that satisfactory results might be expected from red copper oxide and vasco 4 at the rate of 1·5 per cent. Of the various standard grades and brands of zinc oxide which were tested, Röhm and Haas AAZ Special was significantly superior to the other brands, and vasco 4 was better still.

Dusting the spinach seed with red copper oxide, vasco 4, or zinc oxide is recommended as the most practical, effective, and cheap treatment (costing under local conditions about 20 or 30 cents per acre) for early autumn sowings, but not for late autumn or spring plantings.

WHITE (H. L.). **The sterilization of Lettuce seed.**—*Rep. exp. Res. Sta. Cheshunt, 1934*, pp. 41–45, 1935.

In further experiments at Cheshunt on lettuce seed sterilization [*R.A.M.*, xiii, p. 676] calcium hypochlorite (bleaching powder) was added to distilled water at the rate of 5 gm. per 70 c.c., the mixture being stirred, allowed to settle, decanted, and used immediately. Four

to eight hours is recommended as a suitable duration for the treatment, but any period between 15 minutes and 24 hours should give satisfactory results. Sterile samples were obtained in only 3 minutes, and after 15 minutes 90 per cent. of the treated seed was clean. Subsequent washing reduced the risk of injury. Germination remained unimpaired by any period of treatment under 24 hours.

CHAZE (J.) & SARAZIN (A.). **Le parasitisme du Champignon de couche par la môle est un phénomène réversible.** [The parasitism of the edible Mushroom by the 'môle' is a reversible phenomenon.]—*C.R. Acad. Sci., Paris*, cc, 21, pp. 1781–1783, 2 graphs, 1935.

An account is given of experiments in which transfers from the hymenial layer of the edible mushroom (*Psalliota*) [*campestris*] on carrot juice agar were found to inhibit the growth of the parasite, *Mycogone perniciosa*, in immediate contact with, or close proximity to, this portion of the host [*R.A.M.*, xiv, p. 490]. The invader even failed to grow on a medium which had been in contact with the hymenium of its host, the latter presumably containing diffusible antitoxins, the action of which is weakened in commercial beds, and absent or much reduced in tissues permitting infection.

COMTE. **Essais de bouillies cupriques au bicarbonate de soude dans la lutte contre le mildiou.** [Tests of cupric sprays with bicarbonate of soda for the control of mildew.]—*Progr. agric. vitic.*, ciii, 10, pp. 229–234, 3 figs., 1935.

The copper sulphate-bicarbonate of soda spraying mixture is prepared by adding powdered bicarbonate to a copper sulphate solution at the rates of 2·5 kg. to 3 kg. in 100 l. whereby carbon dioxide is freely generated by the action of the sulphate on the carbonate and this property is made use of to develop pressure in the spraying apparatus, two types of which (haversack and traction) are described. The apparatus consists essentially of a hermetically sealed body, in which the mixture of the two substances is effected after it is closed. In the traction sprayer the initial and final working pressures are stated to be 4 and 1·5 kg. [per sq. cm.], respectively. Field tests in 1935 indicated that the spray is as efficient as Bordeaux mixture and the copper hydroxide spray in the control of vine mildew [*Plasmopara viticola*], and is more wetting than either. The working of the new spraying apparatus also compared favourably with that of the ordinary sprayers, and effected an appreciable saving in manual labour.

DULAC (J.). **Étude des conditions de la meilleure efficacité d'une bouillie anticryptogamique au sulfure de cuivre.** [Study of the conditions assuring the highest efficacy of a fungicidal mixture with copper sulphide.]—*Progr. agric. vitic.*, ciii, 15, pp. 345–348, 1935.

The author discusses the advantages of using copper sulphide for the preparation of cupric sprays, especially for the control of vine mildew [*Plasmopara viticola*: *R.A.M.*, xiii, p. 714], and states that whereas alkaline or organic substances added to the spray reduce the solubility and the toxicity of the copper compounds formed from copper sulphide, the addition of copper sulphate and of a small quantity of

vanadium pentoxide was found to promote considerably the oxidation and the efficacy of the copper sulphide spray. The formula which gave the best results in 1934 in preliminary tests is copper sulphide paste 300 gm. (as copper), vanadium pentoxide 1 gm., copper sulphate 100 gm., water 100 l. Further work is still required, however, to determine the best conditions of preparation and application of the copper sulphide spray to avoid injury to the host plants. [This paper is reproduced in *Rev. Vitic., Paris*, lxxxii, 2128, pp. 230–232, 1935.]

DUPUY (A.). **Les travaux de sulfatage.** [Copper-spraying operations.]—*Progr. agric. vitic.*, ciii, 15, pp. 348–351; 17, pp. 394–399, 1935.

The author discusses various aspects of the work of spraying vines against mildew [*Plasmopara viticola*] and for increasing the usefulness of spraying apparatus, with the object of reducing spraying costs under the conditions prevailing in France.

RAVAZ (L.). **Chronique. Encore l'excoriose.** [Current events. Excoriosis again.]—*Progr. agric. vitic.*, ciii, 10, pp. 223–224, 2 figs., 1935.

The author states that excoriosis of the vine (*Phoma flaccida*) [*R.A.M.*, xiv, p. 346] has become in the current year exceptionally severe in certain French vineyards, this being attributed largely to negligence in applying control measures, which are briefly indicated.

VIALA (P.) & MARSAIS (P.). **Le court-noué.** [Court-noué.]—*Rev. Vitic., Paris*, lxxxi, 2092, pp. 69–73; 2093, pp. 85–90; 2096, pp. 133–139; 2099, pp. 181–187; 2101, pp. 213–218; 2102, pp. 229–235, 1934; lxxxii, 2118, pp. 69–72; 2127, pp. 217–223; 2129, pp. 248–251, 1 col. pl., 41 figs., 1935.

This is a detailed account of the authors' studies of the court-noué of the vine attributed by them to the activity of *Pumilus medullae* [*R.A.M.*, xiii, pp. 422, 680; xiv, p. 8], expanding somewhat the information already noticed in this *Review* from other sources.

LARUE (P.). **La maladie de la moelle en Autriche.** [The pith disease in Austria.]—*Progr. agric. vitic.*, ciii, 10, pp. 238–240, 1935.

This is a brief abstract from a recent preliminary paper by F. Zweigelt and F. Voboril (Die Markkrankheit in Oesterreich. [The pith disease in Austria.]—*Das Weinland, 1934*, 10, 6 pp., 6 figs.) on a disease of vine branches, which appears to be contagious and to spread so as to form groups of diseased vines. The disease affects old European stocks, grafted vines, and American direct producers, causing external symptoms very like those of court-noué attributed by Viala and Marsais to *Pumilus medullae* [see preceding abstract]. Longitudinal cracks in the cortex, extending sometimes even to the pith, are characteristic of the disease, and a symptom not described by French authors is that the current year's shoots lignify poorly, especially at the nodes, rendering the extremity of the vine branch movable, as if articulated. The pith of older shoots turns brown, then black, and finally disintegrates into a powder, and the nodal diaphragms are destroyed. The affected pith contains mycelial strands which pass from the pith cells through the medullary rays into the wood and the cortex, the tissues of which are

also disorganized. Attempts to control the disease by replacing diseased stocks by healthy ones have so far given negative results.

HÉDIN (L.). **Observations sur les broussins de la Vigne.** [Observations on Vine excrescences.]—*C.R. Acad. Sci., Paris*, cc, 15, pp. 1351–1353, 1935.

The protuberant excrescences known as 'broussins' [which are often beautifully veined and used for veneer] on the roots, collar, and limbs of vines in France [see next abstract] were found on chemical analysis to contain an excess of potassium and to be markedly deficient, on the other hand, in phosphorus, magnesium, and calcium. The particular kind of gall under observation does not appear to be reproducible by inoculation with *Bacterium tumefaciens*. [This paper also appears in *Rev. Vitic., Paris*, lxxxii, 2132, pp. 299–302, 1935.]

RIVES (L.). **Contribution à l'étude du broussin de la Vigne.** [Contribution to the study of Vine 'broussin'.]—*Rev. Vitic., Paris*, lxxxii, 2127, pp. 213–216; 2129, pp. 245–247, 4 figs., 1935.

The vine tumours termed 'broussin' in France [see preceding abstract] and 'schwarzer Brenner' in Germany are stated to be strongly reminiscent of crown gall [*Bacterium tumefaciens*] and usually to develop after frost injury in the early spring at the base of the stocks and, more rarely, of branches. As a result of his investigations, the author suggests that their origin is due to an abnormal proliferation of the cambium caused by the presence of oxidases which normally migrate to the developing buds and shoots in the spring but return after the death of the young shoots from frost. Although in nature various micro-organisms are abundantly associated with such tumours, none of those isolated by him was able to reproduce the condition on vines of various ages of growth, or to cause crown gall on pelargoniums.

BEAUMONT (A.) & STANILAND (L. N.). **Eleventh Annual Report of the Department of Plant Pathology, Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1934.**—59 pp., 2 figs., 1935.

Only one fungus disease has been found commonly attacking *Anemone coronaria* in Devon and Cornwall, namely, the anemone and plum rust, *Puccinia pruni-spinosae* [*R.A.M.*, xiii, p. 313]. A much more serious trouble is the so-called 'rust' or 'winter browning' of anemones, first observed by the writers in 1926 but of little importance until 1932, when it began to spread and assume a serious form all over Cornwall and North Devon. Diseased roots are brown and decayed, while the leaves show either a general purplish tint or brown rot of the margin, the latter sometimes extending later; rapid rotting of the petioles is also frequent. The flower crop is heavily reduced, the flowers already formed being small and brown-edged, with the result that large brown patches appear in the field. The disease may be a form of root rot, but so far no single fungus has been found to predominate in the affected material. Possibly an excess or deficiency of soil nutrients may be involved in its etiology.

The incidence of potato blight (*Phytophthora infestans*) was again carefully studied in relation to weather conditions [ibid., xiii, p. 561;

xiv, p. 190]. Four periods (two each in August and September) of high relative humidity (not less than 75 per cent. at 3 p.m.) were closely followed by outbreaks of the disease, which in general may be suspected on the basis of this factor alone.

Notes are given on the fungal diseases of cereals, potatoes, root crops, beans, vegetables (including tomatoes), fruit, flowers, and ornamentals observed during the year, and a complete list of crop diseases occurring in Devon and Cornwall is appended.

**The Harper Adams Adviser. A review of advisory work in the West Midland Province 1934–1935.**—*Adv. Rep. Harper Adams agric. Coll.* 10, 23 pp., 1935.

The following are among the phytopathological items occurring in this report. Grey speck of oats in Warwickshire was controlled by an application of manganese sulphate at the rate of 1 cwt. per acre, the yield being increased by 30 per cent. [*R.A.M.*, xiv, p. 575].

In a popular note on clover rot [*Sclerotinia trifoliorum*: see below, p. 685], N. C. Preston states that alsike [*Trifolium hybridum*] and the trefoils [*T.* spp.] are less susceptible to the disease than red clover [*T. pratense*], while the wild white [*T. repens*] appears to be completely immune.

Speyer (W.). **Tätigkeitsbericht der Biologischen Reichsanstalt für Land- und Forstwirtschaft, Zweigstelle Stade, für die Zeit vom 1 April 1934 bis 31 März 1935.** [Report on the work of the Stade Branch of the National Biological Institute for Agriculture and Forestry for the period from 1st April, 1934 to 31st March, 1935.] —Reprinted from *Alländer Ztg, Jork*, 60, 64, 68, 71, 4 pp., 1935.

The following are among the items of phytopathological interest in this report. Fruit trees in all parts of the Lower Elbe Valley are liable to infection by *Pholiota squarrosa* [*R.A.M.*, xii, p. 353] and *Agaricus melleus* [*Armillaria mellea*: ibid., xii, p. 739 *et passim*], one or other of which predominates according to the local climatic and soil conditions. Prevention of attack by these fungi is primarily important in any campaign for their control, which should include a study of the possible sources of inoculum, such as stakes and the like made from forest trees.

In spraying tests against apple scab (*Fusicladium*) [*Venturia inaequalis*] it was again found that Bordeaux mixture made with dolomitic lime [ibid., xii, p. 459] was more effective than that made with a white (marble) lime.

The cause of a destructive rot of horse-radish, which has been under investigation since 1933, is still obscure [cf. ibid., xiv, p. 419].

Hopkins (J. C. F.). **Annual Report of the Branch of Plant Pathology for the year ending 31st December, 1934.**—*Rhod. agric. J.*, xxxii, 6, pp. 397–405, 5 pl., 1935.

The first record of tobacco veinbanding [see below, pp. 685, 723] in Rhodesia was made in 1934, and was suspected to have spread from a neighbouring potato crop. Inoculations of healthy tobacco plants with filtered juice obtained from veinbanded ones gave 100 per cent.

ordinary mosaic. Towards the end of the season the principal causes of deterioration of the tobacco crop were frog eye [*Cercospora nicotianae*: *R.A.M.*, xiv, p. 200] (both the field and barn spot forms) and barn rot (*Rhizopus stolonifer*) [ibid., vii, p. 339]. An outbreak of leaf curl [ibid., xiv, p. 533] in the Shamva district caused heavy losses in spite of the removal of the source of infection (ratoon plants on an abandoned farm) and the replanting of the affected lands, these measures, however, serving greatly to ameliorate the situation. A new type of barn spot was due to *Aspergillus flavus*. An epidemic of rust [*Puccinia* spp.] is estimated to have reduced the wheat crop of the entire colony by one half.

Foot rot (*Phytophthora parasitica*) of garden flowers, particularly *Godetia*, *Clarkia*, *Antirrhinum*, and *Delphinium* spp., was satisfactorily controlled by working a small quantity of ready-made Bordeaux mixture in powder form into the soil round each plant.

New records made in 1934 (other than those already mentioned) include rose anthracnose (*Sphaceloma rosarum*), groundnut pod rot (*R. nigricans*), orange stem-end rot (*Diaporthe citri*) [see below, p. 693] and brown rot (*P. citrophthora*), and tobacco storage mould (*Aspergillus sulphureus*).

WALLACE (G. B.). **Report of the Mycologist, 1934.**—*Rep. Dep. Agric. Tanganyika*, 1934, pp. 90–93, 1935.

In this report [cf. *R.A.M.*, xiii, p. 746] it is stated that the number of rain-forest and savannah trees in Tanganyika which become heavily infected by root disease (*Armillaria* sp.) [ibid., xiii, p. 114] after the aerial parts have been felled seems to be practically limitless, though camphor (*Ocotea usambarensis*) appears to be unaffected. Living trees of *Trema guineensis* are very susceptible, sheets of mycelium having been observed under the bark ten feet from the ground; an additional 23 living hosts (including *T. guineensis*) of *Armillaria* are recorded for Tanganyika, making a total of 54. The fungus has not been observed at elevations of under 3,000 feet.

The disease of coffee, tea, and other plants previously reported as due to a species of (?) *Stilbum* [ibid., xiv, pp. 13, 184] was found in two localities 6,000 ft. or more above sea level and characterized by very cold weather during the rainy season. The fungus multiplies and is destructive only during the cold, wet season; it is most abundant where dampness is favoured by enclosed conditions and where crops are sheltered by *Grevillea robusta* and eucalyptus, which are very susceptible. It was observed on 15 economic species of plants and one indigenous tree, *Bersama* sp.

A preliminary field test indicated that stem rot of sisal [*Agave rigida* var. *sisalana*: ibid., xii, p. 201] is reduced by the application of artificial fertilizers. From infected material a fungus was isolated which caused a localized rot on injured leaves kept in a moist atmosphere, confirming the view based on field observation that an organism enters the sisal while it is being cut during the rains.

*Septoria nodorum* [ibid., xiii, p. 177] was destructive to wheat in Dahaga.

At Morogoro avocado seedlings and young trees 10 ft. high suffered

severely from a disease, apparently of bacterial origin, characterized by the presence of cankers (sometimes along the whole length of the stem and branches) starting as small, water-soaked, raised, grey-brown blisters, which burst, liberating a red gum.

Concentric ring blotch of citrus [ibid., ix, p. 450] was recorded at Usanga, in the Iringa Province, and *Plasmopara viticola* on vines at Ruvu.

MARCHAL (É.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1934.** [Observations and researches carried out at the State Phytopathological Station during the year 1934.]—*Bull. Inst. agron. Gembloux*, iv, 2, pp. 97–105, 1935. [Flemish, German, and English summaries.]

The following items of phytopathological interest are contained in this report, which is on the same lines as those of previous years [*R.A.M.*, xiii, p. 492]. *Gibberella saubinetii* and *Ophiobolus graminis* were observed on wheat grown after oats. Rye near Bruges suffered important losses from a wilting of the young plants due to infection by *Typhula graminum* [ibid., xii, pp. 367, 615, 684; xiv, p. 93], a fungus only once before recorded in Belgium, from the vicinity of Namur.

Potatoes, especially in the Ardennes, were widely attacked by *Alternaria solani*, which seriously damaged the foliage and occasionally caused marked reduction of yield. Pear trees, especially those of the Légipont variety near Herve showed black, necrotic, depressions in the bark due to *Diaporthe parasitica* Marchal. Plum leaves from Brussels were observed to be covered with large, zonate brown spots caused by *Cladosporium condylonema*, the first record of this fungus in Belgium.

Tobacco plantations in the Stanleyville region of the Belgian Congo are stated to have been very severely attacked by a disease closely resembling 'kroepoek' [leaf curl: ibid., xii, p. 791; xiii, p. 806].

PETRI (L.). **Rassegna dei casi fitopatologici osservati nel 1934.** [Review of phytopathological records noted in 1934.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 1, pp. 1–95, 4 figs., 1935.

During the period under review [cf. *R.A.M.*, xiii, p. 562] vine leaf roll [ibid., xiii, p. 353] was present in many localities, frequently developing after several years' healthy growth. Near Palermo cases of progressively increasing infection 12 to 15 years after planting have been observed on previously very vigorous Rupestris vines. The only resistant varieties in these cases were Riparia and Berlandieri, planted in 1894; in 1932, however, the latter suddenly became attacked. In several districts during 1934 the Negro amaro variety showed very pronounced leaf roll; the double grafting of Malvasia bianca on this variety caused the external symptoms to disappear, possibly owing to masking. Vines affected with mycoses of the trunk and branches did not show the presence of *Pumilus medullae* [see above, p. 675].

Notes are given on other vine diseases that may be confused with leaf roll, and attention is directed to the need for correct diagnosis, reference being made to Catoni's method of detecting the endocellular cordons [ibid., xiii, p. 214] under field conditions by cutting a basal

internode transversely, when they can be seen with a low power field microscope (×30 to 50) across the lumen of the vessels.

Non-parasitic 'anthracnose ponctuée' [ibid., vi, p. 459] affected the internodes, especially the basal ones, of vines near Rome. The condition is attributed by Moltz to the death and subsequent discoloration of the stomatal cells and the tissue bordering the stomatal chamber.

A wilt closely resembling Californian dry rot was general throughout the olive-growing districts of Italy [ibid., xii, p. 745]; the cause has not yet been ascertained.

Sibilia found that yellowish and brownish discolorations of the lower and upper surfaces respectively of apple leaves were caused by fumes from a factory, most of the injurious effects being due to sulphur pentoxide and nitrous vapours.

Peach roots, especially those of young trees, were widely attacked by *Pseudomonas* [*Bacterium*] *tumefaciens* [ibid., x, p. 40]. A gnawed appearance of the tegument of shelled almonds was attributed to infection by *Gloeosporium amygdalinum* [ibid., xii, p. 380], followed by a Basidiomycete. Almond roots were also attacked by *Bact. tumefaciens.*

*Corylus avellana* was rather severely infected by *Labrella coryli* (Desm. & Rob.) Sacc., and *Phyllactinia suffulta* [*P. corylea*: ibid., xiii, p. 308].

Attempts to find lemon varieties resistant to 'mal secco' [*Deuterophoma tracheiphila*: ibid., x, p. 593; xiii, p. 474] were extended to Indian and other Asiatic varieties; two Sicilian lemons, Interdonata and Monachella, are appreciably resistant.

Oranges in Catania have for some years been severely attacked by a root rot associated with a *Phytophthora* which in culture formed non-papillate zoosporangia, 50 to 55 by 29 to 32 $\mu$ (in very favourable conditions, 59 to 60 by 42 to 43·5 $\mu$); it grew well at 30° to 32° C. Two species of *Pythium* were also isolated from the infected roots, one of the *de Baryanum* type and the other (probably *P. megalacanthum*) [ibid., xii, p. 372] with a spiny oogonium, which measured (including the 4 to 5 $\mu$ long spines) 33 to 35 $\mu$ in diameter, the oospore being 18 to 19 $\mu$.

*Phytophthora cambivora* was isolated from the cambium of the roots of walnuts showing symptoms resembling those of chestnut ink disease due to the same fungus [ibid., xiii, p. 336]. The ink disease-resistant Japanese chestnuts (*Castanea crenata*) [ibid., xiii, p. 63] planted in Piedmont to test their suitability under Italian conditions have not given very encouraging results, those growing in Cuneo, for example, suffering from the cold; a number of them die off every year.

*Quercus ilex* trees at Rome showed severe infection by the uredo stage of *Cronartium quercuum* [ibid., xii, p. 396]; spraying with 1·5 per cent. Bordeaux mixture gave excellent control.

Nursery seedlings of *Cedrus* [*libani* var.] *deodara* at Funo wilted rapidly as a result of root rot due to *Fusarium fuliginosporum* [ibid., vi, p. 7].

A serious wilt of *Acacia farnesiana* affecting isolated trees was associated with a mycelium in the rotting roots which in culture formed a carbonaceous-black layer with greenish-grey aerial hyphae and black, aggregated, papillate, plurilocular pycnidia of a *Dothiorella*; the ellipsoidal, hyaline, pycnospores measured 3·5 to 4 by 2·2 to 2·5 $\mu$.

Beans (*Vicia faba*) from Sulmona showed the leaf spot due to *Cercospora zonata* and others from Agrigento that due to *C. fabae* [ibid., xiii, p. 670].

Fennel (*Foeniculum*) [*vulgare*] plants were affected by a bacteriosis (? *Bacillus carotovorus*) of the aerial parts and roots around Rome and on the Adriatic coast; the disease causes extremely heavy losses and is still spreading. The necrotic areas on the tap root involved all the cortical parenchyma and the medullary rays, and extended up to the leaf stalks and the veins of the outside leaves.

Tomatoes with fern-leaf symptoms also showed typical mosaic [ibid., xiii, p. 808]. Tomato fruits from Agrigento showed a spotting similar to that caused by *Bact. vesicatorium* [ibid., xii, p. 555]; a bacterium was present in the epidermal tissues and underlying cells.

Geraniums (*Pelargonium* sp.) near Rome were infected by *Macrosporium pelargonii* [ibid., x, p. 461], and zinnias at Orvieto by *Bact. solanacearum.*

**Summary report of progress from July 1, 1932 to June 30, 1934.**—*Bull. Utah agric. Exp. Sta.* 250, 66 pp., 1934. [Received September, 1935.]

The following are some of the references of phytopathological interest occurring in this report. A winter wheat variety, Relief, originating from a cross between Turkey and Hussar and resistant to both types of bunt (*Tilletia tritici* [*T. caries*] and *T. foetens*) found in the State [*R.A.M.*, xii, p. 424] is available for distribution to farmers. Early autumn sowing, where natural soil infection occurred, was found to favour bunt attacks, which did not occur, on the other hand, in spring sowings, indicating that overwintering of the fungi in the soil plays little part in the etiology of the disease. Eight distinct physiologic forms of *T. caries* and *T. foetens* have been isolated from local collections by the use of differential wheat varieties [cf. ibid., xiv, p. 287].

Potato crinkle mosaic [ibid., xiv, p. 524] symptoms have been produced on *Datura* sp. and tobacco, and observations on a number of other Solanaceous plants and common weeds indicate the wide distribution of the disorder.

Bacterial canker of tomatoes [*Aplanobacter michiganense*: ibid., xiv, p. 535] is stated to have cost local growers about $30,000 in 1933. The seed was experimentally proved to be the chief source of primary infection, followed by seed-bed, and then by field soil, infections. From 40 to 60 per cent. of the plants raised from diseased seed developed canker, as against about 34 per cent. of those from healthy seed in an infected cold-frame soil, and only 1·3 per cent. of the stand from sound seed in diseased field soil, from which the causal organism may be adequately eliminated by a triennial crop rotation. Wounded roots appear to be highly favourable infection courts. Under western conditions systemic infection develops only to a limited extent from invasion through such natural channels, incubation periods of 4 to 90 days having been observed. The spread of *A. michiganense* is promoted by low temperatures during germination and seedling development and by medium ones during the growing season. The organism is stated to

be completely eradicable from infected material intended for seed production by fermenting the pulped fruit for 72 to 96 hours prior to seed-extraction; various procedures are on trial with a view to combining effective seed-borne canker control with the best possible use of the juice for canning purposes. Two wild tomatoes and *Lycopersicum pimpinellifolium* appear to be highly resistant to *A. michiganense*, whereas all the dwarf varieties used in the trials showed a high degree of susceptibility.

A rapid extension of bacterial wilt of lucerne [*A. insidiosum*: ibid., xiv, p. 638] has been observed in eight counties; in the Cache Valley the disease may be so destructive as to preclude the possibility of a fourth year's harvest.

Among the fungi isolated from strawberry plants affected by a widespread and virulent root rot were three strains each of *Rhizoctonia* [ibid., xiv, p. 562] and *Fusarium*, two of *Phytophthora* [ibid., xiv, p. 180], and one each of *Mucor* and *Aspergillus*. Conspicuous features of the disease include marginal reddening of the leaves, purpling of the veins, general stunting, shrivelling of the fruit, and destruction of the roots.

Manns (T. F.), Manns (M. M.), & Adams (J. F.). **Department of Plant Pathology.**—*Rep. Del. agric. Exp. Sta. 1933–4* (*Bull.* 192), pp. 40–49, 1 pl., 1935.

The following are among the items of interest in this report [cf. *R.A.M.*, xiii, p. 563].

The myrobalan plum (*Prunus myrobalan*), which is used as budding stock for many American plum varieties, may carry yellows and little peach [see below, p. 704] without showing any very marked symptoms. Evidence was obtained that other plum varieties may show signs of these diseases but live for many years, while heavily infested with the insect vector *Macropsis trimaculata*. One Red June Japanese plum (*P. salicina*), 22 years old, carried over 10,000 of these insects, and was proved by budding to carry the yellows virus. The wild plum variety *P. munsoniana*, also breeds the insect abundantly and carries the yellows virus. *M. trimaculata* was the only insect found breeding throughout the peach-growing area of Delaware on unsprayed plums. In the Ohio Experiment Station plum orchard, Wooster, with trees about 9 years old, which was well sprayed, no plum leafhoppers were found, but thousands were collected from the sprayed plum orchard at Delaware Experiment Station (trees about 27 years old). Peach seedlings were readily infected with both yellows and little peach by plum leafhoppers, while three out of ten 19-year-old peach trees similarly treated showed foliage symptoms resembling those of little peach.

In comparative spraying tests with zinc sulphate alone and in combination with three sulphur sprays and a colloidal sulphur spray for the control of bacterial spot [*Bacterium pruni*: ibid., xiii, p. 564] of peach the best results were given by dry-mix 20 lb., zinc sulphate 10 lb., and hydrated lime 10 lb. (20 lb. when using lead arsenate 1 in 50 for the 'shuck' and 'first cover' applications) per 250 galls. of spray and by sulfospray (3 qts. per 250 galls.), the percentage infection for

these treatments being, respectively, 3·2 and 3·6 per cent. In another test, in which a mixture of zinc sulphate and hydrated lime, each 30 lb. per 300 galls. of spray, was compared with koloform 30 lb. at petal fall, shuck, and first cover, followed by flotation sulphur 30 lb. at second cover (both per 300 galls.), the former treatment gave 4·7 and the latter 10 per cent. infection, the corresponding figures for scab [*Cladosporium carpophilum*: loc. cit.], however, being 14 and 5·4 per cent.

Of a number of sulphur and copper fungicides tested against apple scab [*Venturia inaequalis*] the best results were obtained with dritomic [ibid., xi, p. 385], kolofog [ibid., xiii, p. 528, and below, p. 693], and coposil [ibid., xiv, p. 150], which on the Grimes variety gave 0·7, 3·8, and 2·6 and on Jonathan, 1·4, 2·7, and 0·7 per cent. infection, respectively.

**Forty-fifth Annual Report of the Alabama Agricultural Experiment Station for the fiscal year ending June 30, 1934.**—30 pp., 1 fig., [? 1934. Received August, 1935].

The following items of phytopathological interest occur in this report. *Mycosphaerella* [*pinodes*] was found by J. L. Seal to be the most prevalent disease of winter peas and vetches [*Vicia* spp.: *R.A.M.*, xiv, p. 614], though species of *Ascochyta* were also responsible for some damage. The pycnospores of the fungi formed during the summer and autumn of 1933 retained a high percentage of viability until late November, when young plants were readily infected by covering them with old diseased material. The organisms remained almost inactive throughout the early part of the winter, but after the February and March frosts they developed profusely on practically every plant in the stand. Vetches appear to be generally more resistant to the fungi under observation than peas, Hungarian and certain Oregon vetch strains being specially promising as cover crops.

O. C. Medlock's storage experiments with Stuart and Frotscher pecans [*Carya pecan*] showed kernel moulding to be the most serious problem. A temperature below 40° F. was apparently necessary to keep the nuts in marketable condition for a year.

Osmun (A. V.). **Department of Botany.**—*Rep. Mass. agric. Exp. Sta., 1934*, pp. 23–27, 1935.

The following items of phytopathological interest occur in this report, to which W. L. Doran and E. F. Guba contribute. Slight foliage injury to greenhouse cucumbers was caused by spraying with a resin solution (1 in 135) [*R.A.M.*, xii, p. 493] four times at weekly intervals against *Peronoplasmopara* [*Pseudoperonospora*] *cubensis* [ibid., xiii, pp. 418, 496]; the solution gave less control than Bordeaux mixture (3-3-50). Weather conditions in August appear to have less effect on the disease than those in July, early outbreaks being associated with heavy rain in the latter month.

Infection of lettuces by *Bremia lactucae* [ibid., xiii, p. 496] was equally well prevented by Bordeaux mixture 4–4–50, 2–2–50, and 1–1–50, applied six times at weekly intervals; at the strongest of these

concentrations the mixture significantly retarded growth. The following lettuce strains were markedly resistant to infection: Blonde Pionnel (Clause), Merveille d'Hiver (Clause), Batavia Beau Jolaise (Clause), Batavia White Paris (Bulleri), and May Wonder (Benary).

Evidence was obtained confirming the view that eggplant wilt (*Verticillium albo-atrum*) [ibid., xii, p. 494] may be seed-borne, seed from plants showing the characteristic brownish discoloration of the fibro-vascular bundles in the distal half of the fruit being infected. Hot water treatment at 117·5° F. for 30 minutes killed the fungus without apparently injuring the seed.

Bewley tomato hybrids crossed with Norduke showed partial resistance to leaf mould (*Cladosporium fulvum*) [ibid., xiii, pp. 496, 685]. Only limited resistance can be expected as a result of hybridizing varieties within the species *Lycopersicum esculentum*, but the hybrids obtained by crossing the immune variety *L. pimpinellifolium* [ibid., xiv, p. 202] with three varieties of *L. esculentum* showed in the $F_2$ a heterozygous condition for all characters, and immunity appeared in the ratio of 3:1. Selections from immune individuals are being grown in the $F_3$ generation to establish resistant lines and to back-cross with the parent varieties of *L. esculentum*, i.e., Belmont, Break o' Day, and Success, for desirable fruit size.

Efforts to find a suitable means of disinfecting stored squashes [*Cucurbita* sp.] showed that burning sulphur at the rate of 5 lb. per 10,000 cu. ft. of storage gave excellent disinfection but injured the fruit. Further work with sulphur dioxide is in progress. Formaldehyde gas generated from 9 oz. of 40 per cent. formaldehyde solution with 6 oz. of potassium permanganate and used in 1,500 cu. ft. of storage space for 12- to 24-hour periods (any number of treatments up to this total of hours) was effective for all practical purposes. The optimum temperature for the growth of the organisms responsible for storage decay of squashes (among which *Bacillus tracheiphilus* [ibid., xiii, p. 212] caused more damage than all the others combined) was approximately 78° F., though in a few cases it ranged between 75° and 85°; the maximum ranged from 92° to 97°, while the minimum was generally 40°, exceptionally 33° to 35°. Infection chiefly occurs at the stem end, but is also found at the blossom end.

One-and-a-half acres were planted to yellows-free and otherwise healthy Howard 17 strawberries [ibid., xiii, p. 41] for plant production; in 1935 over 100,000 plants will be distributed to local growers.

New carnation varieties resistant to *Alternaria dianthi* [ibid., xiii, p. 497] included Orchid Beauty, Bonanza, Mrs. M. Beverlein, Joy, Chief Kokomo, and Mary E. Sim.

Post-germination damping-off [ibid., xiv, p. 382] of herbaceous ornamental plants was well controlled by soil treatment with ammonium hydroxide 1 in 30 to 1 in 50, calcium cyanamide 12 to 16 gm. per sq. ft. of soil (3 in. deep) and by raw pyroligneous acid [ibid., xi, p. 589] 4 in 100, both liquids being applied at the rate of 2 qt. per sq. ft.

Sulphur fungicides reduced rust (*Gymnosporangium juniperi-virginianae*) on Wealthy apples [ibid., xiv, p. 368] to some extent, but even the best of five materials tested, viz., liquid lime-sulphur and Linco colloidal [illegible], reduced infection by only 50 per cent.

**Forty-seventh Annual Report of the Kentucky Agricultural Experiment Station for the year 1934. Part I.**—67 pp., 1935.

The following items of phytopathological interest occur in this report. Etch and cucumber mosaic of tobacco [*R.A.M.*, xii, p. 205] were unusually prevalent in 1934. Infection of the same host with the vein-banding virus [ibid., xiv, pp. 605, 677] declined from 86 per cent. among plants in close proximity to Irish Cobbler potatoes to 2 per cent. in the rows at a distance from the latter. The soil carry-over of mosaic was again investigated in plots showing in the previous year no mosaic, 100 per cent. yellow, and 100 per cent. green mosaic [ibid., xiv, p. 85], but no evidence was obtained of infection from the soil in the new crop up to blooming time. Where cut-up yellow mosaic stalks were 'disked in' just before setting, 3 per cent. yellow mosaic developed during the summer, the corresponding figure for green mosaic being slightly over 6 per cent.; 1 per cent. green mosaic also occurred where no stalks were disked in.

Most of the 30 strains of tobacco mosaic inoculated into a resistant tobacco collected by Nolla in Colombia [cf. ibid., xiv, p. 401] produced no visible effect, but several caused the development of a necrotic spot or ring near the point of entrance which failed to become systemic. All the strains producing no external symptoms assumed a systemic form, but the virus did not enter the growing point.

A very promising new variety of White Burley tobacco, Kentucky No. 16, resistant to root rot [*Thielaviopsis basicola*: ibid., xiii, p. 13] has been developed by hybridization.

A further comparative study of the agent of crown rot of clover producing spring apothecia with *Sclerotinia trifoliorum* [ibid., xiii, p. 240, and above, p. 677] has shown that the two organisms are distinct, the former corresponding closely in ascospore dimensions and cultural growth rate with *S. sclerotiorum* [ibid., xiv, pp. 39, 315].

Raspberries sprayed with Bordeaux mixture in 1933 retained their foliage much better than unsprayed plants, on which the leaves were destroyed by *Septoria* [*Mycosphaerella rubi*: ibid., xiii, p. 174]. Some 85 per cent. of the untreated Latham canes died back during the winter, compared with only 25 per cent. of the sprayed. In 1934 the fungus did not develop until about midsummer, after which unsprayed canes were defoliated. The Chief variety appears to be rather more susceptible than Latham to *M. rubi* and the subsequent winter injury.

Bouriquet (G.). **Madagascar : phytopathological notes.**—*Int. Bull. Pl. Prot.*, ix, 6, pp. 125–128, 1935.

Free copper treatment of some 100,000 Arabian coffee trees against *Hemileia vastatrix* [*R.A.M.*, xiii, p. 505] is stated to have been carried out by the Itasy (Madagascar) local administrative authorities for propaganda purposes.

*Helminthosporium turcicum*, the agent of a highly destructive maize disease [ibid., xiv, p. 431], affecting especially late varieties such as Plata, was first recognized in the colony early in 1934.

Tobacco in the Miandrivazo district is liable to the same diseases as

on the high tablelands, including crinkle [leaf curl: ibid., xi, p. 478; xii, p. 58] and 'kroepoek' [see above, p. 679].

PINCKARD (J. A.). **Physiological studies of several pathogenic bacteria that induce cell stimulation in plants.**—*J. agric. Res.*, l, 12, pp. 933–952, 1 diag., 3 graphs, 1935.

In an attempt to throw some light on the nature of the stimuli responsible for atypical and pathological proliferation of living cells the author made comparative physiological studies of the crown gall organism *Phytomonas* [*Bacterium*] *tumefaciens*, the causal agent of bacterial pocket rot (considered to be a modified gall) of sugar beet (*P.* [*Bact.*] *beticola*) [*R.A.M.*, x, 424], the olive knot organism (*P.* [*Pseudomonas*] *savastanoi*) [ibid., xiii, p. 551], and the oleander tubercle organism (*Phytomonas* [*P.*] *savastanoi* var. *nerii*) [ibid., xiii, p. 748]. The results [which are shown in tabular and graphical form] indicated that while *Bact. tumefaciens* was pathogenic to all the hosts used, *P. savastanoi* var. *nerii* was pathogenic to oleander and olive, and the beet rot and olive knot organisms were each only able to attack their original hosts. On the common bacteriological culture media used the different bacteria gave growth reactions distinctive for each, with the exception that the olive knot and oleander organisms showed similar cultural characters. The optimum temperature for growth on agar was about 28° C. for all the bacteria except *Bact. beticola*, which formed the largest colonies at about 32°. The hydrogen-ion concentration at which growth was inhibited in liquid media was found to vary from $P_H$ 3·6 to 4·4 in the acid, and from 9·5 to 10·5 in the alkaline, range. Comparative studies of the utilization by these organisms of compounds containing nitrogen and carbon showed that the inability of certain of them to utilize several of the compounds was not due to unfavourable oxidation-reduction intensities of these media at hydrogen-ion concentrations approaching neutrality. It was further shown that all the organisms produced relatively strong reducing potentials in undisturbed liquid cultures, this being in opposition to the oxidizing action of acid metabolic products.

MATSUMOTO (T.) & OKABE (N.). **Bacteriophage in relation to Bacterium solanacearum. I. Temperature relation, specificity, and serological reaction.**—*J. Soc. trop. Agric.*, vii, pp. 130–139, 1 pl., 1935.

A brief description is given of the technique used in obtaining the bacteriophage from *Bacterium solanacearum* in diseased tomato tissues in Formosa, Japan [cf. *R.A.M.*, xiii, p. 152]. Inactivation of the lytic principle was effected by five minutes' exposure at 64° C., the corresponding periods at 65°, 62°, 61°, and 60° being 3 to 4, 13 to 16, 18 to 25, and 80 minutes, respectively. The multiplication of the bacteriophage was most profuse in the series of tubes incubated at 34°, the approximate optimum for the growth of *Bact. solanacearum*. None of the thirteen species of bacteria [which are listed] exposed to the action of the bacteriophage of *Bact. solanacearum* proved susceptible to its influence. The injection of the bacteriophage into rabbits was followed by the production of neutralizing, but not of specific precipitating or agglutinating, antibodies.

**Anvisningar rörande utsädesbetning.** [Directions for seed-grain disinfection.]—*Flygbl. Växtskyddsanst., Stockh.* 13, 7 pp., 4 figs., 1934. [Received August, 1935.]

This pamphlet, a revised edition of No. 2 in the same series, gives directions in popular terms for the treatment of cereal seed-grain in Sweden against some well-known fungous diseases [*R.A.M.*, xiii, p. 87].

Melander (L. W.). **Effect of temperature and light on development of the uredial stage of Puccinia graminis.**—*J. agric. Res.*, l, 11, pp. 861–880, 3 figs., 2 graphs, 1935.

The results of the laboratory experiments reported in some detail in this paper showed that uredospores of *Puccinia graminis tritici*, *P. g. avenae*, *P. g. secalis*, and *P. g. phlei-pratensis* that had been hardened to cold by exposure for ten days or longer to a temperature of 0° C. were more resistant to much lower temperatures (−29° to −40°) than those that had not been so hardened; in a dry condition the treated uredospores of *P. g. tritici* and *P. g. phlei-pratensis* survived at least 45 days, and those of *P. g. avenae* 40 days' constant exposure to these temperatures. In the non-hardened series a few uredospores of *P. g. tritici*, *P. g. phlei-pratensis*, and *P. g. avenae* remained viable for 45, 35, and 15 days respectively, at these low temperatures. Daily alternations of temperatures above and below 0° C. had no greater killing effect on the non-hardened uredospores of physiologic form 15 of *P. g. tritici* than constant freezing, but killed more hardened spores after nine days than the latter. Low temperatures lengthened the incubation period of the rust, about a week longer being required for the formation of uredosori on plants kept at 10° than at 20°, and much longer on plants kept at 0° to 1°; at this temperature *P. g. tritici* form 35 formed uredosori in about 70 days, but form 15 did not produce them in 80 days on plants that were placed at this temperature 48 hours after inoculation [cf. *R.A.M.*, xiv, p. 500].

The investigation further showed that the mycelium of at least some physiologic forms of *P. graminis* (e.g., *P. g. tritici* form 35 and *P. g. secalis* form 7) can withstand as low temperatures as the host can. Physiologic forms of *P. g. tritici* and *P. g. avenae* differed in their ability to produce uredosori at low temperatures; thus, *P. g. tritici* form 36 at 0° to 1° produced normal uredosori readily, while forms 15 and 35 only formed a few minute pustules, and *P. g. avenae* form 2 did not produce uredosori as readily as form 5. *P. g. secalis* form 7 formed normal uredosori at this temperature. A temperature of 0° to 1° stimulated the production of the teleuto stage.

Light intensity did not appear to have a significant effect on the type of infection produced, but low intensities delayed the formation of uredosori. On the other hand, the intensity and quality of light seemed to affect the size and shape of the uredospores. In *P. g. tritici* form 15 the spores produced under a light intensity of 301 foot-candles at 20° C. were significantly longer than those produced under other light conditions, and uredospores produced in artificial light were significantly longer and narrower than those produced in the greenhouse.

Tavčar (A.). **Lodicules et culture de Froment résistant au charbon.** [Lodicules and Wheat breeding for loose smut resistance.]—ex 16me Congrès int. Agric., Budapest, 1934. Rapp. spéc. Budapest: Min. Agric., Sect. 4, Thème 2, pp. 1–9 [1934. Abs. in *Exp. Sta. Rec.*, lxxiii, 2, pp. 193–194, 1935.]

That the Prolific winter wheat variety showed about seven times as much natural infection by loose smut (*Ustilago tritici*) in Jugo-Slavia as did the du Banat variety, in spite of the fact that artificial inoculations revealed no difference in average susceptibility between the varieties, was probably due to the larger size of the lodicules in Prolific, in which variety the glumes, on an average, opened 9·58° wider and remained open 3 minutes longer than was the case with du Banat. It is, therefore, concluded that lodicule size is of importance in the development of wheat varieties resistant to *U. tritici*.

Machacek (J. E.) & Greaney (F. J.). **Studies on the control of root-rot diseases of cereals caused by Fusarium culmorum (W. G. Sm.) Sacc. and Helminthosporium sativum P., K., and B. III. Effect of seed treatment on the control of root rot and on the yield of Wheat.**—*Sci. Agric.*, xv, 9, pp. 607–620, 1935. [French summary.]

The results of laboratory, greenhouse, and field experiments [details of which are given] from 1932 to 1934 showed that seed treatment with semesan and ceresan both in liquid and in dust form, and also new improved ceresan and uspulun in liquid form gave good control of the foot rot of wheat, oats, and barley, caused by *Fusarium culmorum* and *Helminthosporium sativum* in Canada [*R.A.M.*, xiv, p. 298]. All the liquid organic mercury compounds were used at the concentration of 5 per cent. Semesan was slightly superior to ceresan and new improved ceresan, and unlike them, caused little or no seed injury. Uspulun was the least effective. No practical control was given by copper carbonate either in dust form or in solution, or by nickel sulphide or iodine-infusorial earth (containing 5 per cent. iodine by weight) as dusts [cf. ibid., x, p. 119], while formaldehyde (1 in 320 commercial formalin solution) tended to increase the intensity of the disease, apparently by its retarding influence on the growth of the seedlings, and markedly decreased the yield.

The fact that all the organic mercury compounds significantly increased the yield of Marquis wheat in 1932 (by 8 bushels per acre in plots raised from ceresan-treated seed), but not in 1933 or 1934, which were unusually dry during the early part of the growing seasons, would suggest that the efficiency of seed treatment against foot rots depends to a certain extent on the amount of moisture in the soil at the time of, and subsequent to, sowing.

Brömmelhues (Maria). **Die wechselseitige Beeinflussung von Pilzen und die Bedeutung der Pilzkonkurrenz für das Ausmass der Schädigung an Weizen durch Ophiobolus graminis Sacc.** [The reciprocal influence of fungi and the significance of fungal competition in relation to the extent of injury to Wheat from *Ophiobolus graminis* Sacc.]—*Zbl. Bakt.*, Abt. 2, xcii, 4–7, pp. 81–116, 10 figs., 1935.

A series of experiments [which are fully described and the resulting

data tabulated] was carried out at the Bonn Agricultural College to determine the reciprocal effects of contact between cultures on biomalt agar and wheat extract solution of *Ophiobolus graminis*, *Cercosporella herpotrichoides*, *Fusarium culmorum*, *Helminthosporium sativum*, *Cladosporium herbarum*, *Alternaria* (?) *tenuis*, *Penicillium* sp., *Mucor* sp., and *Bacillus coli* [cf. *R.A.M.*, xii, pp. 109, 684; xiv, pp. 569, 570].

*O. graminis* was most effectively inhibited in culture on both solid and liquid media by *H. sativum* and *P.* sp., *A.* (?) *tenuis* being also actively antagonistic in the latter. Among the consequences of competitive suppression may be mentioned temporary or permanent cessation of growth, often at a considerable distance from the opposing mycelium, reduced vegetative development and reproductive capacity, and anomalies of pigmentation. Inhibition is apparently due, not alone or in the first place to the withdrawal of nutrient material, but rather to the secretion by the antagonistic organism of thermostable, readily diffusible substances.

It was shown by soil inoculation tests on Heines Kolben [Club] wheat seedlings in pots that *O. graminis* causes the most severe damage on plants previously exposed to four weeks' infection by most of the above-mentioned fungi, especially *C. herbarum* [ibid., xiii, p. 21], the virulent toxins produced by which evidently increase susceptibility to the first-named pathogen. On the other hand, plants grown in soil simultaneously inoculated with *O. graminis*, *H. sativum*, and *P.* sp. suffered less than those infected by the first-named alone, though the weakly antagonistic forms *A.* sp., *M.* sp., and especially *C. herbarum*, similarly applied, increased the injury caused by *O. graminis*.

These facts are considered largely to explain the widely observed virulence of *O. graminis* on light soils of poor adsorptive capacity [ibid., xiii, pp. 87, 758], in which the root-attacking toxins formed by its saprophytic concomitants can disperse without hindrance; hence the value under such conditions of an admixture of clay or activated charcoal.

Ewert (R.). **Pflanzenkrankheiten und Witterung. Starkes Auftreten von Mehltau, Roggenbraunrost und Fritfliege im Herbst 1934.** [Plant diseases and weather. Heavy incidence of mildew, brown rust of Rye, and frit fly in the autumn of 1934.]—*Mitt. Landw., Berl.*, l, 16, p. 337, 1935.

A number of plant diseases, such as brown rust of rye [*Puccinia secalina*: *R.A.M.*, xiv, p. 300] and barley and rye mildew [*Erysiphe graminis*: ibid., xiv, p. 433], are stated to have been favoured in the autumn of 1934 in the Grenzmark district of Germany by the heavy rains following an abnormally dry summer. Early sown rye (up to the middle of September) was most severely, but by no means exclusively, affected. This crop suffered most damage on light soils, the virulence of the rust being further intensified where rye followed rye as compared, for instance, with a serradella [*Ornithopus sativus*]-rye rotation.

No differences in varietal reaction to *E. graminis* were shown by Friedrichswerther Berg, Peragis, Mahndorf, Carstens Two-rowed, and other standard barleys. Here again early sowing promoted infection, but in order to secure adequate yields under local conditions the seed

must be in the ground by about 10th September. Rye was injured chiefly in densely planted stands.

Dennis (R. W. G.). **Notes on the occurrence of Pyrenophora avenae Ito, in Scotland.**—*Trans. Brit. mycol. Soc.*, xix, 4, pp. 288–290, 9 figs., 1935.

After referring to his previous communication on *Helminthosporium avenae* in Scotland [*R.A.M.*, xiii, p. 365; xiv, p. 558], the author states that in January, 1934, a few King Oats stems collected in Ayrshire bore perithecia, only one of which contained mature ascospores. Single-spore cultures made from it gave rise to a tufted aerial mycelium typical of *H. avenae* which within a month freely produced conidia of the fungus. As the season advanced rudimentary perithecia became more abundant on the stubble, but the proportion of them containing mature asci remained extremely low as late as May. A morphological study of the Scotch perithecia showed that they correspond closest to Ito's description of *Pyrenophora avenae* [ibid., x, p. 233], with which the fungus is identified, differences from Ratschlag's description of *Pleospora avenae* [ibid., x, p. 234] being noted in several respects. It is suggested that the divergences in Ratschlag's diagnosis are best ascribed to the artificial and presumably somewhat unfavourable conditions under which the perfect stage described by him developed.

Borzini (G.). **Il 'carbone' del Granturco nell'annata 1934 nella regione dell'Agro Romano.** [Maize smut in 1934 in the region of Agro Romano.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 1, pp. 96–115, 1 graph, 1935. [English summary.]

Field studies [which are described, and the results of which are tabulated and discussed] on a severe outbreak of *Ustilago zeae* [*R.A.M.*, xiii, pp. 89, 226, 749] on seven-week-old maize near Rome in the summer of 1934 showed that precocity and irrigation each favoured infection, the early varieties Ideale and Saverio showing 14 and 23 per cent. infection, respectively, in the non-irrigated plots, as compared with 35 and 62 per cent., respectively, in the irrigated ones. The late varieties Nostrano dell' Isola Bassa and Mastodont growing in irrigated plots showed, respectively, 23 and 36 per cent. infection. In the irrigated plots the early varieties were mainly infected in the stem and tassels and the late ones on the leaves; in the non-irrigated plots most of the infections occurred in the male inflorescences. The severity of the outbreak was associated with high relative atmospheric humidity, rain at the end of June, small differences between the maximum and minimum daily temperatures, and strong winds [cf. ibid., v, p. 664; vii, p. 779].

Smith (O. F.). **The influence of low temperature on seedling development in two inbred lines of Corn.**—*J. Amer. Soc. Agron.*, xxvii, 6, pp. 467–479, 2 figs., 4 graphs, 1935.

In a series of controlled greenhouse trials at the Wisconsin Agricultural Experiment Station seedlings of the $RYD_4$ inbred line of maize grown at a soil temperature of 16° C. were highly resistant to blight (*Gibberella saubinetii*) to which, on the other hand, those of $GG_{26}$ proved very susceptible [cf. *R.A.M.*, viii, p. 376]. Seedlings of the

cross $RYD_4 \times GG_{26}$ proved more resistant than the $F_1$ progenies of the reciprocal cross.

Tu (C.) & Li (H. W.). **Breeding Millet resistant to smut in North China.**—*Phytopathology*, xxv, 6, pp. 648–649, 1935.

Of 1,430 head selections of millet (*Chaetochloa* [*Setaria*] *italica*) from various parts of Honan, North China, 192 remained free from smut (*Ustilago crameri*) [*R.A.M.*, xiii, p. 629], which caused losses up to 25 per cent. in 1932, in an inoculation experiment in 1933, while about 80 were more susceptible than the variety used as a control.

Kirby (G. W.), Frey (C. N.), & Atkin (L.). **The growth of Bread moulds as influenced by acidity.**—*Cereal Chem.*, xii, 3, pp. 244–255, 1 fig., 1935.

The results [which are discussed and tabulated] of experiments at the Fleischmann Laboratories, New York, on the relation of acidity to the growth of bread moulds (represented by *Aspergillus niger*) [*R.A.M.*, xii, p. 757; xiv, p. 383] indicated that in a liquid bread medium prepared from a mixture of 3 1 lb. loaves and 4 l. water at 35° C. the fungus exhibits no well-defined optimum for development with respect to the hydrogen-ion concentration range at which commercial bread is produced. The activity of the mould was not affected by the addition to the medium at $P_H$ 3·5 of calcium acid phosphate, tartaric, phosphoric, lactic, or citric acids at 0·2, 0·4, or 0·6 per cent., whereas complete inhibition of growth followed the incorporation with the substratum of acetic acid at the same concentrations. The toxicity of acetic acid to *A. niger* was found to vary according to the acidity of the medium; the higher the latter, the lower the concentration of the disinfectant necessary for complete inhibition of growth. Ninety-grain 'distilled' vinegar, added to doughs at the rate of 0·5, 1, or 2 per cent. of the quantity of flour, was found to exert a preventive action on the growth of *A. niger* on finished baked loaves. This substance is commonly used at the two lower strengths for the prevention of 'ropiness'.

Weston (B. J.). **'June drop' of Citrus.**—*Cyprus (agric.) J.*, xxx, 2, pp. 43–44, 1935.

The abnormal shedding of immature citrus fruits known as 'June drop', and associated chiefly with an unbalanced water relationship at, and just before, blossoming lasts from May to July in Cyprus, where it frequently causes serious losses. Hot, dry winds aggravate the condition, which is further intensified by the local lack of soil moisture and available nitrogen during blossoming. The fluctuation from day to day (consequent on climatic factors) in the moisture content of the rapidly developing fruits leads to the formation of an abscission layer, with consequent yellowing and dropping, generally before a diameter of half an inch has been reached. Recommendations are made for control by the applications of manures and nitrogenous fertilizers, irrigation, and the provision of wind-breaks.

Ruggieri (G.). **Una grave epidemia di marciume radicale fra gli Agrumeti di Fondi (Littoria).** [A serious epidemic of foot rot in the Citrus groves in Fondi (Littoria).]—*Ital. agric.*, lxxii, 6, pp. 515–518, 1 fig., 1935.

The author states that in the course of the last ten years orange groves in the Fondi district [northern border of the Campagna] have become increasingly affected with gummosis [the symptoms of which are very briefly described]. Isolations mainly yielded a species of *Phytophthora* apparently closely related to *P. parasitica* [*R.A.M.*, xiv, p. 506], as well as species of *Fusarium* either alone or in association with the former, the effect of the last-named organisms being to aggravate the symptoms. The epidemic spread of the disease, until at present the very existence of the groves is at stake, is considered to be due chiefly to the high susceptibility of the local orange and to the fact that it is grown almost exclusively on its own roots. The only certain means of eradicating the trouble is to replace the old affected trees by others grafted on sour orange stock, after disinfecting the holes with copper sulphate or with Bordeaux mixture. Since, however, growers avoid grafting the orange on such stocks, as they hold that the operation retards the seasonal development and produces fruits with a thick and coarse rind, the author discusses prophylactic measures in some detail.

Chaudhuri (H.). **Infection by Colletotrichum gloeosporioides, Penz.**—*Proc. nat. Inst. Sci. India*, i, 2, pp. 71–75, 1 fig., 1935.

Spores of *Colletotrichum gloeosporioides* placed on the upper surface of Malta orange leaves produce on germination appressorium-like structures adhering firmly to the cuticle [*R.A.M.*, xii, p. 566]. At the same time certain products are secreted that react on the cuticle and the plasma membrane and diffuse into the underlying cells, filling them with water, before the occurrence of actual penetration. The injection of the cells with water was artificially induced by placing on the leaves for 30 to 40 hours drops of water in which spores had been allowed to germinate and then filtered off; on subsequent flooding with a dilute solution of erythrosin the dye was absorbed by the injected areas only. The fine, peg-like infection hyphae recorded by Dey [loc. cit.] were not observed, penetration being effected by ordinary germ-tube-like structures.

Ruehle (G. D.). **Spraying for the control of Citrus scab.**—*Citrus Ind.*, xvi, 5, pp. 8–9, 17–18, 1935. [Abs. in *Chem. Abstr.*, xxix, 14, p. 4884, 1935.]

Consistently better control of citrus scab [*Sporotrichum citri*] was given [in Florida: *R.A.M.*, xiv, p. 578] by copper-containing than by sulphur and mercury fungicides, the most reliable and effective results being obtained with home-made Bordeaux mixture (3–4–50 plus 1 per cent. oil). Copper cyanamide was less efficacious and also caused a heavy increase in scale insect infestation. Basic copper sulphate sprays (1·5–50) gave promising indications, but Bordol-Mulsion (a proprietary copper-oil combination) proved inferior as a fungicide to Bordeaux

mixture; both these preparations, however, left less visible residue on the foliage than Bordeaux mixture and did not favour scale insects to the same extent as the latter. Lime-sulphur sprays, with the addition of kolofog or wettable sulphur [ibid., xiv, p. 591] arrested mild cases of scab but were less effective than the copper preparations against melanose [*Diaporthe citri*: ibid., xiv, p. 161] blemishes on fruit and foliage.

VENKATARAYAN (S. V.). **Control of anaberoga of Areca and Coco-nut Palms.**—*Mysore agric. Cal. 1935*, pp. 33, 37, 1 diag., 1935.

Anaberoga root disease of areca palms [*Areca catechu*: *R.A.M.*, xiii, p. 682] kills 15 to 20, and in severe outbreaks up to 60, trees per acre every year in areca gardens in Mysore, where it is probably general in the open, grassy areas. On coco-nuts the same condition [due to *Ganoderma lucidum*: ibid., xiv, p. 611] is present in the Honnavalli and Sira areas and near Arsikere, and appears to be spreading. Control measures consist in digging isolation trenches 1 ft. wide by 2 to 3 ft. deep and the burning of infected material.

GUILLIERMOND (A.). **Sur un champignon nouveau, parasite des capsules du Cotonnier, l'Eremothecium ashbyii et ses relations possibles avec le Spermophthora gossypii et les Ascomycètes.** [On a new fungus, *Eremothecium ashbyii*, parasitic on Cotton bolls, and its possible relationship to *Spermophthora gossypii* and the Ascomycetes.]—*C. R. Acad. Sci., Paris*, cc, 19, pp. 1556–1558, 1935.

Details are given of the author's studies of a fungus which was forwarded to him for identification by S. F. Ashby, and which had been originally collected by R. E. Massey on cotton bolls at Berber in the Sudan. On solid media the organism forms gelatinous, yellow colonies. The mycelium is more or less dichotomous, at first continuous but later divided by septa into plurinucleate cells of varying length. Numerous sporangia are formed at the end of 48 hours; when mature they are 68·2 to 87·5 by 14 to 15 $\mu$ in diameter and contain irregularly arranged spores, the number of which apparently varies from 4 to 32 (mostly 12 to 16). The spores measure 29 to 31·8 by 2 to 2·77 $\mu$, are rounded or wedge-shaped at one end while the other end terminates in a very long, acute, and curved point, apparently devoid of cytoplasm. When transferred to fresh media the spores germinate at any point of their surface by a germ-tube which grows dichotomously and reproduces the original, sporangium-bearing mycelium.

Although in certain points it resembles *Ashbya* (*Nematospora*) *gossypii* [*R.A.M.*, x, p. 692; xiv, p. 507], the fungus is referred to the genus *Eremothecium* [ibid., v, p. 389] under the name *E. ashbyii* n.sp. [without a Latin diagnosis]. From a systematic standpoint it is stated that while the sporangia show a great resemblance to asci in the method in which the spores are differentiated, the fact that they are developed from plurinucleate cells precludes attributing to them the value of true asci. In conclusion the suggestion is advanced that the genera *Eremothecium* and *Nematospora* may be forms standing close to *Spermophthora* [ibid., xi, p. 606] which have lost the aptitude of producing zygospores [ibid., vii, p. 405], and that all the three genera

may represent an ancestral group of inferior Ascomycetes forming a transition between the Syphomycetes and true Ascomycetes. The author has found that *S. gossypii* has, during the eight years that he has had it in culture, lost the capacity for conjugation between the gametes, which germinate without fusion and give rise directly to the gametophytic generation.

Porges (N.), Muller (J. F.), & Lockwood (L. B.). **A Mucor found in fowl.**—*Mycologia*, xxvii, 3, pp. 330–331, 1935.

This is a brief record of the constant association with a high-mortality epidemic of young chickens at the New Jersey Agricultural Experiment Station of a fungus which was isolated from the inflamed gizzard of the dead birds and which in pure culture produced luxuriant growth and sporulation of a *Mucor* allied to *M. hiemalis* [*R.A.M.*, xiv, p. 655] and *M. javanicus*. The species is thought probably to be a transitional form between the sub-genera *Mono-* and *Cymo-Mucor*, and is referred to *M. javanicus*.

Giordano (A.). **Rôle du 'Torulopsis neoformans' (Sanfelice) Red. en pathologie humaine.** [The role of *Torulopsis neoformans* (Sanfelice) Red. in human pathology.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 4, pp. 119–123, 1935.

A comparative study of the cultural, morphological, and biochemical characters of *Torula histolytica* Stoddard and Cutler (20 strains) [*R.A.M.*, xiv, p. 100], *T. nasalis* (= *Torulopsis neoformans* var. *nasalis*), *Torulopsis neoformans*, *T. hominis* (Vuill.) Red. (3 strains), *T. hominis* var. *honduriana* and *Blastomyces neoformans* entirely confirmed Lodder's conclusions as to the relationship of these organisms [ibid., xiv, p. 192] which, with three exceptions, were found to be identical and are referred to *T. neoformans* (Sanf.) Red. The exceptions were two of the strains ascribed to *Torula histolytica* (one of which proved to be a new variety of *Torulopsis neoformans* and is named var. *sheppei*, and the other had all the characters of a *Mycotorula*) and *T. neoformans* var. *nasalis* which had smaller blastospores than the type. A list of 16 synonyms of *T. neoformans* is cited by the author.

In culture on solid media *T. neoformans* forms a whitish, almost ochraceous-yellow, later brownish-yellow, ropy crust. In liquid media, spherical, oval, or elliptical blastospores are formed, rarely elongated, suggesting a rudimentary mycelium; large, round, chlamydospores are often produced in abundance and measure up to 10 $\mu$ in diameter. The organism does not liquefy gelatine, assimilates dextrose, levulose, maltose, and organic nitrogen, acidifies culture media, and is pathogenic to the rat, in which it causes well marked meningo-encephalitic granulomata.

Oláh (D.). **Über die Schimmelpilze der erkrankten Haut und ihre Rolle bei der Entstehung, bzw. beim Verlauf verschiedener Hautkrankheiten.** [On the moulds of diseased skin and their role in the origin or course of various dermatoses.]—*Derm. Wschr.*, c, 25, pp. 703–712, 1935.

A tabulated account is given of the writer's studies during the last

three years in Hungary on 1,379 cultures from miscellaneous dermatoses, the results of which showed that various moulds are capable, not only of modifying the action of the fungi causing certain skin diseases but also of producing independent disturbances. Thus, *Acrostalagmus cinnabarinus* [*R.A.M.*, xiii, p. 769] has been found as a concomitant of *Microsporon audouini* [ibid., xiv, p. 102] in the hair, and refractory cases of eczema were associated, for instance, with *Cephalosporium acremonium* [ibid., viii, p. 783], *Monosporium engelhardti*, *Botrytis cinerea*, *Scopulariopsis brevicaulis* [ibid., xiv, p. 104], and *S. blochi*. These organisms may retard the cure of the conditions with which they are associated, either by their metabolic products or their vital processes. As regards the actual causation of pathological conditions by moulds, trichophytia profunda was twice found to be due to *A. cinnabarinus* (also found by A. Fazakas to be pathogenic to the eye) and once to *S.* (?) *blochi*. Evidence is adduced in support of these statements in view of which the term 'kerion' is considered preferable to 'trichophytia'. *B. cinerea* was repeatedly isolated from a superficial 'trichophytosis' of the chest and successfully inoculated into animals.

Powell (H. M.) & Jamieson (W. A.). **On merthiolate and fungi associated with ringworm.**—*Proc. Ind. Acad. Sci.*, xliii (*1933*), pp. 56–70, 7 figs., 1934.

A tabulated account is given of the writers' laboratory experiments with merthiolate [*R.A.M.*, xii, p. 509] in the control of three ringworm fungi, *Trichophyton purpureum*, *Epidermophyton* [*T.*] *rubrum* [loc. cit.], and *Microsporon lanosum*. In dilutions up to and including 1 in 10,000 the mercurial was found to be uniformly fungicidal to all three organisms; at 1 in 20,000 only the two last-named succumbed. Promising results were given by the incorporation of merthiolate in a semi-solid stearate cream consisting of triethanolamine and carbitol to facilitate its use in human mycotic skin disorders.

Sartory (A.), Sartory (R.), Meyer (J.), & Weiss (R.). **Étude d'un 'Cladosporium' nouveau 'Cladosporium tropicalis' n.sp. isolé d'une dermatomycose tropicale.** [A study of a new *Cladosporium*, *Cladosporium tropicalis* n.sp., isolated from a tropical dermatomycosis.]—*Bull. Acad. Méd. Paris*, cxiii, 24, pp. 890–892, 1935.

A species of *Cladosporium* isolated from cutaneous lesions on negro patients at Dr. A. Schweitzer's hospital, Lambaréné, French Equatorial Africa, is regarded as new and named *C. tropicalis*. On Sabouraud's maltose-glucose agar the fungus forms cerebriform, glistening, smooth colonies, brown at first, turning almost or entirely black; on Raulin's medium, on the other hand, a thick, greyish 'veil' is produced but no black pigment. The optimum temperature for growth on the latter substratum at $P_H$ 6·2 was found to be 28° to 30° C. On unskimmed milk, which undergoes coagulation and peptonization, the colonies are orange. The thick-walled hyphae measure 4 to 9 $\mu$ in breadth, with individual segments 9 to 12 $\mu$ long, are sparsely branched, and give rise in liquid media to numerous round or oval yeast-like cells.

Reiss (F.). **Eine neue pathogene Hefe des Genus Mycotorula.** [A new pathogenic yeast of the genus *Mycotorula*.]—*Zbl. Bakt.*, Abt. 1 (*Orig.*), cxxxiv, 3–4, pp. 189–191, 3 figs., 1935.

From the sputum of a 44-year-old male patient suffering from bronchial pneumonia at Shanghai the writer isolated a yeast forming on glucose or malt beer agar, and liquid beer wort spherical to slightly elliptical spores, 6 to 10 $\mu$ in diameter, mostly proliferating by budding but occasionally extruding short pseudo-hyphae, and (in older cultures in potato water) relatively long mycelial elements with well-developed verticils, sometimes budding. The organism grew best at 37° C., but satisfactory development was also made at room temperature. The colonies were of a creamy consistency, whitish to yellowish, and readily separable from the substratum. Glucose, mannose, and levulose were utilized with resultant acid and gas production (most extensive in the case of mannose). Inoculation experiments on laboratory animals demonstrated the markedly pathogenic character of the yeast, which is considered to be a new species of *Mycotorula*, *M. sinensis* Reiss.

Moore (M.). **Cultivation and study of Pityrosporum ovale, the so-called bottle bacillus of Unna.**—*Arch. Derm. Syph., Chicago*, xxxi, 5, pp. 661–671, 1 fig., 1935.

*Pityrosporum ovale* [*R.A.M.*, xiv, p. 509] can be isolated from the scalp when seborrhaea is present, the substratum found to be most favourable being Difco wort agar with a $P_H$ of 4·8. Growth becomes apparent on the third or fourth day, turning the greyish implanted scale creamy-white. In the scalp the fungus appears as an ovoid or spherical cell, with or without budding, 2 to 4 $\mu$ in the long axis or up to 11 $\mu$ in diameter. On 19 artificial media [the characters of the fungus on which are fully described] the dimensions are variable, thick-walled, spherical cells or chlamydospores up to 5 $\mu$ in diameter being formed on some. In several media elongated and sclerotic forms develop, as well as series of oidioid cells. The colour of the giant colonies varies according to the medium from a light ochraceous-salmon to a cinnamon-buff. Acid without gas was produced with galactose, dextrose, d-mannose, levulose, maltose, saccharose, and melitose. Gelatine was not liquefied or milk coagulated.

Briefly discussing the taxonomy of the organism, the writer considers the retention of the name *P. ovale* to be the wisest course in the present confused state of dermatological opinion on the subject.

Kharasch (M. S.) & Legault (R. R.). **The new active principle(s) of ergot.**—*Science*, N.S., lxxxi, 2112, pp. 614–615, 1935.

Evidence is adduced to show that the ergot [*Claviceps purpurea*] alkaloid described by Dudley and Moir under the name of 'ergometrine' [*R.A.M.*, xiv, p. 51[illegible] and next abstract] is not identical with ergotocin, which is stated to have been first separated from the 'known ergot alkaloids' by the writers in 1923. Analyses of pure ergotocin show a carbon content of 68·41 per cent. compared with 71·46 per cent. for ergometrine, while the physiological properties of the two substances, though similar in kind, differ appreciably in degree.

Thompson (M.). **The new active principle of ergot.**—*Science*, N.S., lxxxi, 2113, pp. 636–639, 1935.

The writer discusses his reasons (based on similarity of decomposition points and optical activity) for holding that ergometrine, ergotocin, and ergostetrine, ergot [*Claviceps purpurea*] alkaloids separated, respectively, by Dudley and Moir in England, Kharasch and Legault [see preceding abstract], and the writer in the United States, are one identical substance. Priority is claimed for the name 'ergostetrine' which was announced in May, 1934, but in any case it is considered highly desirable that this important new alkaloid should be known by a single name.

Jaretzky (R.). **Alkaloidgehalt und Wirksamkeit saprophytischer Mutterkornkulturen.** [Alkaloid content and efficacy of saprophytic ergot cultures.]—*Arch. Pharm., Berl.*, cclxxiii, 6, pp. 348–357, 2 graphs, 1935.

It has been estimated by the writer that the amount of ergot [*Claviceps purpurea*: see preceding abstracts] annually required by chemists and pharmacists in Germany is about 40,000 kg., of which only 1 per cent. is produced in the country. During the world-war, when the necessary quantities could not be procured from abroad, the shortage was unpleasantly felt, and in view of the present economic crisis it seemed advisable to explore the possibilities of production on a saprophytic substratum, for which a maltose-peptone-agar combination proved suitable [cf. *R.A.M.*, i, p. 422; viii, p. 561]. The results [which are tabulated and discussed] of preliminary experiments along these lines were extremely encouraging. The quantity of alkaloid produced by the fungus after 30 days' growth on the above-mentioned medium corresponded to 2·45 mg. ergotamin bitartrate—an amount equal to that yielded by 60 small sclerotia. Tested by its reversion of the action of adrenalin [ibid., xi, p. 39] the culture product gave completely satisfactory results.

Sartory (A.), Sartory (R.), Meyer (J.), & Baumli (H.). **Quelques champignons inférieurs destructeurs du papier.** [Some lower fungi destructive to paper.]—*Papier*, xxxviii, 6, pp. 529–530, 533–536, 539–542, 7 figs., 1935.

Further extensive studies [the results of which are fully discussed and the relevant statistical data tabulated] on the fungal destruction of paper [*R.A.M.*, xiv, p. 584] led to the following main conclusions. *Cladosporium herbarum* var. *cellulosae* and *Aspergillus fumigatus* var. *cellulosae* assimilate cellulose most actively on a medium containing neither additional carbohydrates nor organic nitrogen (peptone) but with 0·5 per cent. potassium nitrate, the process reaching a climax about the 60th day of culture by which time half the cellulose destroyed in 200 days has disappeared. Under similar conditions, however, the cellulolytic properties of *Fusarium coeruleum* are weak, this fungus definitely requiring organic nitrogen in the form of peptone or the like. Assimilation by *F. coeruleum* describes a slow but regular upward curve during the first 120 days and reaches an abrupt peak between the 120th and 150th, representing the consumption of 30 to 40 per

cent. of the total cellulose assimilated during the test. Under natural conditions *F. coeruleum* is the only one of these three that seems to feed directly on the cellulose by its morphologically normal, sterile hyphae. The damage by the other two is associated with the development of morphologically irregular reproductive organs.

Passing to the second group of cellulophagous fungi under observation, it was found that both *Actinomyces cellulosae* and *Monilia cellulosophaga* possess marked cellulolytic properties, the former being the more destructive of the two. Two peaks occur in the process of assimilation, one being reached at the 50th and the other towards the 150th day of culture.

Generally speaking, the various kinds of damage to paper observed in these studies are produced by the action of a single fungus, but occasionally two are associated, e.g., *F. coeruleum* with an apparently non-pathogenic *Stachybotrys* [ibid., xiv, p. 585], and *A. cellulosae* with *M. cellulosophaga*.

After a lengthy discussion of the morphological and physiological aspects of the fungal deterioration of paper, the writers proceed to a consideration of the factors involved in its occurrence. Foremost among these are the use of inadequately disinfected gums, washing of the whitened paste in polluted waters, and drying of the gummed and moistened paper in powerfully ventilated desiccators without proper arrangements for the disinfection of the air. The following mixture has been found to act as a valuable antiseptic for gum: mercuric chloride and vuzine (hydrocuprein), each at 0·02 per cent., silicofluoride and sunoxol [ibid., xi, p. 622], each at 0·05 per cent. *A. cellulosae* was found to be the most frequent contaminant during the winter and spring of the river water commonly used in the factories, whereas in summer and autumn *M. cellulosophaga* and *F. coeruleum* predominated. Filtration of such waters is therefore an important means of combating fungal disintegration of paper.

BUNYARD (G. N.). **Iris troubles.**—*Gdnrs' Chron.*, xcvii, 2531, pp. 430–431, 2 figs., 1935.

Popular notes are given on the symptoms and control of leaf spot and leaf rust of iris (*Heterosporium gracile* [*R.A.M.*, xiv, pp. 448, 586] and *Puccinia iridis* [ibid., xiii, p. 380], respectively), and also of two obscure conditions affecting the plant in England, namely, 'scorch' and rhizome rot, the former being more prevalent in dry, and the latter in wet, seasons. 'Scorched' plants are conspicuous by their flaccid, rust-brown leaves, shrunken, hard rhizomes, and dead roots. In cases of rhizome rot, the fans of foliage show brown zones, usually near the base, and later collapse; a very disagreeable odour is emitted by the rotten tissues at the junction of the rhizome and leaf fan, while the roots are also in an unhealthy state. An organism apparently identical with *Bacillus carotovorus* [ibid., x, p. 125] was isolated from the diseased rhizomes but failed to cause infection of healthy plants under controlled conditions, so that it is evidently not the primary agent of the rot. The condition of plants affected by both the last-named disorders may be improved by the excision of decayed material, removal of all roots, 20 minutes' immersion in Condy's fluid [potassium permanga-

nate], a few days' exposure to the sun, and transference to a selected site in a mixture of peat and sharp sand.

MATSUMOTO (T.). **Differentiation of two Petunia mosaic diseases by means of serological, cytological, and inoculation experiments.**—*Bot. & Zool.*, iii. 5, pp. 893–898, 3 figs., 1935. [Japanese.]

Two different types of *Petunia* mosaic [*R.A.M.*, v, p. 509; vi, p. 431; xii, p. 580] were observed at Taihoku, Japan, of which one (A) tends to exhibit more pronounced 'clearing of the veins' in the early stages of infection than (B). Other distinguishing features of the former are its specific serological reactions, absence of inclusion bodies, and mode of transmission. With regard to the last-named, type (B) shares with ordinary tobacco mosaic the property of transmission by the sap from petunia to tobacco and conversely [ibid., xiii, p. 192], whereas (A) is transmissible by the insertion of diseased leaf fragments into growing stems but not by expressed sap.

WALTER (MARTA). **Botrytisfäule an Kakteen.** [*Botrytis* rot of Cactaceae.]—*Ratschl. Haus, Garten, Feld*, x, 6, pp. 91–93, 1 fig., 1935.

A popular note is given on the rotting of Cactaceae and other succulents caused by *Botrytis cinerea* in the Munich district of Germany and its control by appropriate cultural measures, including the application to the soil of hakaphos (5 gm. per 10 l. water) or huminal tablets containing humic substances, nitrogen, phosphoric acid, and potash.

LEMESLE (R.). **Mycocécidie florale produite par le Fusarium moniliforme Sh. var. anthophilum (A. Br.) Wr. sur le Scabiosa succisa L.** [Floral mycocecidium caused by *Fusarium moniliforme* Sh. var. *anthophilum* (A. Br.) Wr. on *Scabiosa succisa* L.]—*Rev. gén. Bot.*, xlvii, 558, pp. 337–362, 3 pl., 13 figs., 1935.

After referring to his previous communications [*R.A.M.*, ix, p. 543; xii, p. 292; xiii, p. 448] on the infection of numerous *Scabiosa succisa* flowers in the neighbourhood of Nantes by *Fusarium anthophilum* (which has been recently reclassified by Wollenweber [ibid., x, p. 626] as *F. moniliforme* var. *anthophilum*), the author gives a fully illustrated account of his studies of the anatomical changes in the floral organs brought about by the invasion of the fungus. The results showed that the fungus, which was invariably found in the affected flowers, caused hypertrophy of the parenchyma of the involucels, of the walls of the ovary which failed to form a pericarp, and of the parenchyma of the styles. The ovules never developed, but the stamens always matured normally and the anthers always contained numerous pollen grains.

PALM (B. T.). **Pythium på vattenväxter.** [*Pythium* on aquatic plants.]—*Bot. Notiser, 1935*, 3–4, pp. 317–318, 1935. [English summary.]

*Pythium de Baryanum* has been found causing large, blackish lesions on *Nymphaea alba* and less extensive, greyish spots on *Sparganium simplex* and *Iris pseudacorus* in the water-lily ponds of the Lund Botanic Garden, this being apparently the first record of the fungus on aquatic plants. Repeated isolations were made in pure culture from the necrotic tissues of the affected hosts, and in the case of *N. alba* the pathogenicity

of *P. de Baryanum* was established by inoculation experiments and re-isolations from the resulting lesions.

TANDON (R. N.). **A note on the genus Mitteriella.**—*Curr. Sci.*, iii, 12, pp. 613–614, 7 figs., 1935.

In 1935, the author observed *Mitteriella zizyphina*, recently recorded on living leaves of *Zizyphus rotundifolia* in India [*R.A.M.*, xii, p. 395], growing vigorously on numerous branches and fruits on the same host, as well as on all the aerial parts of *Z. oenoplia* and the fruits of *Z. jujuba*. Infection was greatest during or after severe cold, and heavier on the sunny than on the shady side of the bushes.

SAMPSON (KATHLEEN). **The presence and absence of an endophytic fungus in Lolium temulentum and L. perenne.**—*Trans. Brit. mycol. Soc.*, xix, 4, pp. 337–343, 1935.

After referring to Miss McLennan's papers on the endophytic fungus of *Lolium* spp. [*R.A.M.*, v, p. 379], the author gives a tabulated account of her own observations during six consecutive seasons on the progeny of individual fungus-infected and fungus-free *L. temulentum* and *L. perenne* plants, the results of which showed that both species can exist either with or without the endophyte. In the infected plants the fungus invades the leaves, stems, tiller buds, and ovules, and in perennial plants is distributed by vegetative propagation. Reciprocal crossing of fungus-infected and fungus-free plants indicated that the organism is mechanically inherited from the female parent alone. The endophyte did not appear to invade the roots and is believed to be distinct from the Phycomycete type which has been recorded in these two species and other grasses, as well as in plants not closely related [cf. ibid., xiv, p. 248].

The investigation showed further that lines free from infection may arise from infected individuals, but the origin of the infected lines is still obscure, and the identity of the organism, as well as the biological aspects of its association with the grasses have still to be solved. The evidence at hand suggests, however, that the relationship is not an obligate one so far as the grasses are concerned.

HÄNDLER (E.). **Ergebnisse eines Fusikladiumbekämpfungsversuches vom Jahre 1934.** [Results of a *Fusicladium* control experiment of the year 1934.]—*Obst- u. Gemüseb.*, lxxxi, 5, pp. 68–70, 6 graphs, 1935.

Details are given of an experiment conducted in 1934 at the Horticultural Plant Protection Institute, Pillnitz, Saxony, in the combined control of apple scab (*Fusicladium*) [*Venturia inaequalis*: *R.A.M.*, xiv, p. 517] and codling moth [*Cydia pomonella*], on the basis of which the following general recommendations are made: (*a*) for four treatments: two applications of 1 per cent. Bordeaux mixture and two of 3 per cent. lime-sulphur (1) at the emergence of the buds, (2) just before the opening of the flower-buds, (3) after petal-fall, and (4) a month later; (*b*) for three treatments: three applications of Bordeaux mixture (1) 1 per cent., (3) and (4) 0·5 per cent.; urania (Bordeaux mixture and lead arsenate) (1) 1·5 per cent., (3) and (4) 1 per cent.; copper spray

'935' as for urania; Wacker's Bordeaux mixture [ibid., xiv, p. 371] (1) 1 per cent., (3) and (4) 0·75 per cent.; Bayer's Bordeaux [ibid., xiii, p. 449] (1) 1·5 per cent., (3) and (4) 1 per cent.; nosprasit 'O' [ibid., xiii, p. 776] (Bordeaux and arsenic) (1) 1 per cent., (3) and (4) 0·75 per cent.; and cupromaag [ibid., xiii, p. 582] (1) 0·2 per cent., (3) and (4) 0·15 per cent. The increase in sound fruits in the urania-treated plots amounted to 43 per cent.

Colhoun (J.) & Muskett (A. E.). **Fish eye rot of Apples.**—*Gdnrs' Chron.*, xcvii, 2530, pp. 418–419, 1 fig., 1935.

Attention is drawn to a mild and apparently isolated case of the fish-eye rot of Bramley's Seedling apples caused by *Corticium centrifugum* in County Armagh, Northern Ireland. This is believed to be the first record of the disease [the symptoms of which are briefly described] on home-grown apples in Great Britain or Ireland, though it was reported in 1931 from England on fruit imported from Canada [*R.A.M.*, x, p. 434], and has been known since 1903 in the United States. The fungus made good growth on 2 per cent. malt extract agar and other standard media, identification being facilitated by its sweet, aromatic, pungent odour and the typical clamp-connexions produced by the mycelium. Spores were not observed on the apples but were readily produced in culture on various media.

Harley (C. P.). **Water-core [of Apples].**—*Proc. Wash. St. hort. Ass.*, pp. 105–108, 1934. [Abs. in *Chem. Abstr.*, xxix, 15, pp. 5148–5149, 1935.]

In the early stages of water core [*R.A.M.*, xiv, pp. 243, 592] the affected apple tissues are characterized by rapid starch hydrolysis and a corresponding increase in soluble sugars and osmotic pressure [ibid., xi, p. 56]. After the tissues have been solidly water-cored for some time, the osmotic pressure remains high but the soluble sugars decrease and ethyl alcohol is formed to the extent of 1 per cent. by weight in severely diseased samples of certain varieties. Heavy applications of nitrogen intensify the incidence of water core, which is further promoted by conditions under which the conversion of starch into sugar is more rapid than manufacture of starch from sugar. Water core is most prevalent in Washington on the fruit of young trees or on that of older ones bearing a light crop where the ratio of leaves to fruit is high.

Kearns (H. G. H.), Marsh (R. W.), & Martin (H.). **Combined washes. Progress report.**—*Rep. agric. hort. Res. Sta. Bristol, 1934*, pp. 109–125 [1935].

In further tests at Long Ashton with combined insecticidal-fungicidal sprays [*R.A.M.*, xii, p. 774; xiii, p. 103], combinations of refined petroleum oil (1 per cent.) and lime-sulphur (1 per cent.) were used as post-blossom drenching sprays on a wide range of commercial apple varieties without damage. The addition of crystalline ferrous sulphate to lime-sulphur-lead arsenate at the rate of 5 lb. per gall. of lime-sulphur concentrate reduced the formation of soluble arsenate, obviated sludge production, and increased the visibility and adherence of the spray

deposit; as ferrous sulphate also liberates the monosulphide sulphur of lime-sulphur in the form of free sulphur it should further increase the fungicidal value of the mixture.

THOMAS (H. E.) & ARK (P. A.). **Fire blight of Pears and related plants.**—*Bull. Calif. agric. Exp. Sta.* 586, 43 pp., 7 figs., 1934. [Received July, 1935.]

This bulletin summarizes the information obtained up to date in the investigation of the fireblight (*Bacillus amylovorus*) [*R.A.M.*, xiv, p. 370] problem of pome fruits in California and elsewhere in the United States, and gives an additional list of 34 species of the Rosaceae which have been found to be susceptible to the disease; fireblight in severe form, however, appears to be restricted to a small number of plants closely allied to the pear and apple. Abundance of new infections in the spring depend to a considerably greater extent on the number of active cankers in the orchard than on external sources of infection. Further evidence is adduced to show that beehives infected with the fireblight organism are not a source of infection to the blossoms [ibid., xiv, p. 318], and that atmospheric humidity is important in the establishment and development of the disease chiefly through its effect on the quantity and sugar content of nectar [ibid., xiii, p. 707]. The bacteria present in fireblighted plant tissues were found to withstand air temperatures higher than those usually prevailing in Californian orchards during summer. It was shown in controlled experiments that the organism was not able to penetrate through three-day-old wounds in the pear roots.

In discussing control measures it is stated that a few growers obtained marked reduction in blossom blight by spraying the blossoms with weak Bordeaux mixture, but this method requires further testing.

A bibliography of 73 titles is appended.

GOIDÀNICH (G.). **Una nuova specie di 'Ophiostoma' vivente sul Pero ed alcune osservazioni sull'esatta posizione sistematica della forma ascofora e delle forme metagenetiche del genere.** [A new species of *Ophiostoma* living on Pear and some observations on the exact systematic position of the ascigerous form and the metagenetic forms of the genus.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 1, pp. 122–168, 19 figs., 1935. [English summary.]

In this paper the author gives an exhaustive account of his investigations into the morphological, cultural, sexual, anatomical, and pathological characters and the systematic position of a fungus isolated from decaying pear plants and named by him [with Latin diagnoses] *Ophiostoma catonianum* [*R.A.M.*, xiv, p. 274] G. Goid. n.sp., Stilbaceous form, *Graphium pirinum* G. Goid., n.sp., Mucedinaceous form, *Hyalodendron pirinum* G. Goid. n.sp. The fungus is homothallic; in monospore cultures from the ascospores as well as from conidia perithecia were always obtained. In its anatomical structure it is near the Perisporiales and cannot be referred to Saccardo's genus *Ceratostomella* [cf. *R.A.M.*, xiv, p. 274, and below, p. 726]; the fertile zone of the ascocarp is localized in the centre of the perithecium and is surrounded by a layer of sterile cells.

The author agrees with Nannfeldt [loc. cit.] in considering that the species ascribed to *Ceratostomella* and having the characters of *O. catonianum* should be kept distinct, the correct genetic name for them being *Ophiostoma* Syd. He transfers to *Ophiostomella* Petr. the species *Ceratostoma pirinum* Ade as *O. pirina* (Ade) G. Goid., and also probably the genus *Chaetoceratostoma* Turc. & Maff., *Ophiostomella* being included in the Ophiostomataceae Nannf. and occupying the same position in regard to *Ceratostoma* that *Ophiostoma* occupies in regard to *Ceratostomella*. On *C. penicillata* Grosmann [ibid., xii, p. 409] a new genus *Grosmania* G. Goid. is based, the metagenetic form of which is *Scopularia penicillata* (Gros.) G. Goid. *Ophiostoma lignorum* (Wr.) G. Goid. and *O. majus* (v. Beyma) G. Goid. [ibid., xiv, p. 471], formerly referred to *Ceratostomella*, are further transfers to *Ophiostoma*. *Hyalodendron* [ibid., xiv, p. 69] is believed to be the Mucedinaceous form of *Ophiostoma*.

According to a new scheme of classification of the genus *Graphium* the Stilbaceae that are metagenetic forms of *Ophiostoma* remain in it, while the others are distributed among *Nematographium* n.g. G. Goid., *Pleurographium* n.g. G. Goid., and *Graphiopsis* Bainier.

Henrick (J. O.). **Brown rot of stone fruits, Sclerotinia cinerea (Bon.) Schroet., syn. : Monilia cinerea (Bon.).**—*Tasm. J. Agric.*, vi (N.S.), 2, pp. 73–79, 4 figs., 1935.

The author states that the brown rot fungus (*Sclerotinia cinerea*) [*S. laxa*; but cf. *R.A.M.*, vi, p. 619 and next abstract: = ?*S. fructicola*] is present in Tasmania, in normal years causing negligible losses to peaches, apricots, nectarines, plums, and cherries. During the 1934–5 season, however, in many instances the rot assumed epidemic proportions in northern Tasmania, where conditions were favourable to the fungus. This fact, as well as the possibility that the trouble may gain in intensity throughout Tasmania, impels the author to give general recommendations for its control, most of which are well known in practice.

Harrison (T. H.), **Brown rot of fruits and associated diseases of deciduous fruit trees. II. The apothecia of the causal organisms.**—*J. roy. Soc. N.S.W.*, lxviii, pp. 154–176, 1 pl., 1 fig., 1935.

Continuing his studies on the three species of *Sclerotinia* associated with brown rot of fruits and related diseases of the trees [*R.A.M.*, xiii, p. 33], the author gives a comprehensive account of his critical examination of the various records of their apothecia. While Aderhold's and Ruhland's description of *S. fructigena* is stated to be still the most complete available so far, the apothecia described in 1912 by Westerdijk from Holland and those described in 1931 by Solkina from the U.S.S.R. [ibid., xi, p. 310] are both referred to this species, and an additional record of the fungus on mummified apple in 1919 in Bologna, Italy, is also confirmed from the author's examination of the specimens. Weber's statement of the occurrence of the apothecial stage in Denmark [ibid., v, p. 559], on the other hand, was impossible to substantiate, as there appear to be no specimens preserved.

Aderhold's and Ruhland's record of *S. laxa* and that of Wormald of

*S. cinerea* in 1921 are cited as two excellent descriptions of the same fungus for which the name *S. laxa* is preferred; an additional collection of the fungus in England in 1932 is also described in some detail. In 1930 numerous apothecia on mummified wild plums were found in the Caucasus by J. G. Dickson, the incomplete evidence at hand indicating that they belonged either to *S. laxa* or *S. fructigena*, or to both.

A brief review is given of the numerous existing records of *S. fructicola*, which are supplemented by critical observations of the fungus in the United States and Australia.

A comparative examination of the apothecia of *S. laxa* and *S. fructicola* suggested that they are morphologically indistinguishable from each other, but the striking differences between the two species in the imperfect stage warrant their separation, and further evidence in this connexion is reserved for later publication.

Harrison (T. H.). **Brown rot of fruits and associated diseases in Australia. II. An interesting Discomycete, Sclerotinia aestivalis Pollock, occurring on mummified fruits.**—*Mycologia*, xxvii, 3, pp. 302–318, 1 pl., 2 figs., 1935.

An account is given of the author's studies of apothecia which were found in 1921 in Australia on apricot mummies in an orchard in which, earlier in the year, apothecia of *Sclerotinia fructicola* [at the time thought to be probably a form of *S. fructigena*: *R.A.M.*, ii, p. 120] were obtained from similarly mummified apricots. These proved to be identical with Pollock's *S. aestivalis* reported from Michigan in 1909. In New South Wales the apothecia have been found very abundantly on mummified apples, apricots, peaches, pears, plums, and quinces. They have also been abundantly obtained in monospore cultures on a wide range of media in the laboratory in Australia, England, and America, some of which were maintained fruiting for 13 years. In spite of repeated attempts the macroconidial stage was never produced on any of the media or under any of the conditions tested. The fungus was shown to be a saprophyte for all practical purposes, although it caused a very slow rot of apples under favourable conditions of growth; it is suggested, however, that it may possibly be parasitic on the pseudosclerotium of *S. fructicola*. Whetzel, to whom the fungus was submitted, considers that it is a typical *Ciboria*, and on his authority the author suggests for it the new combination *C. aestivalis* (Pollock) Whetzel.

Manns (T. F.) & Manns (M. M.). **Plums as factors in the dissemination of yellows and little Peach.**—*Trans. Peninsula hort. Soc.*, xxiv (*1934*), pp. 72–76, 3 figs., 1935.

From Nebraska eastwards the plum hopper (*Macropsis trimaculata*), previously shown to be the vector of peach yellows and little peach [see above, p. 682], has been found in all the peach-growing States. Observations made on peach, plum, apricot, and cherry branches from twelve different States showed that the Jassid feeds most freely on plums, the Japanese *Prunus salicina* being more heavily infested than the European (*P. domestica*) or American (*P. americana*) varieties. Peach and apricot were occasionally infested in unsprayed areas, but not cherry. It has already been experimentally shown that Oriental

plum varieties are capable of masking the symptoms of yellows and little peach and of living for years after infection [ibid., xiii, p. 564]. This is particularly true of the Abundance, Chalco, and Chabot varieties of *P. salicina*, while the Satsuma, Santa Rosa, and Red June varieties of the same species show an inward rolling of the leaves without much impairment of their vitality.

HARTZELL (A.). **A study of Peach yellows and its insect vector.**—*Contr. Boyce Thompson Inst.*, vii, 2, pp. 183–207, 4 pl., 1 diag., 2 graphs, 2 maps, 1935.

In this account of investigations in the United States over a number of years into peach yellows [see preceding abstract] the author reports transmission by infected leafhoppers (*Macropsis trimaculata*) [*R.A.M.*, xiv, p. 498] in 14 out of 84 peach trees, all of 75 controls remaining healthy. Forty-seven other insects and mites tested failed to transmit the disease. The first symptoms appeared between 42 and 268 days (average 147 days) from feeding. Of the one-year-old trees exposed to the leafhoppers only 3·6 per cent. became diseased, as compared with 32·2 per cent. of the trees three years old or more. Both nymphs and adults were capable of transmission. Of the trees exposed before and after 23rd June, 36·4 and under 10 per cent., respectively, became diseased. The incubation period in the insect did not exceed 22 and 32 days for nymphs and adults, respectively; when both were used the average was 25 days. The insect hibernates in the egg stage in the bark of wild plum (*Prunus americana*) and there appears to be one generation a year. The shyness of this species and its small numbers, combined with the fact that it is normally found on plum rather than peach, have probably delayed its recognition as the vector of peach yellows. As compared with other leafhoppers of economic importance *M. trimaculata* is a rare species.

Transmission was also effected by budding, but not by means of diseased pollen or mechanical inoculation.

The principal host of *M. trimaculata* is *P. americana*, which was found in orchards that consistently showed a high incidence of yellows in spite of the careful removal of the diseased peaches. The known distribution of the insect in the United States roughly corresponds with that of the disease.

The removal of *P. americana* from the vicinity of peach orchards, combined with roguing, would assist in control [ibid., vii, p. 792].

BEVILACQUA (I.). **Una grave infezione nei Ciliegi.** [A serious infection of Cherries.]—*Istria agric.*, N.S., xv, 11, pp. 252–254, 1935.

In the spring of 1935 cherries growing in the north coastal area of Istria were widely attacked by the blossom wilt due to *Sclerotinia cinerea* [*S. laxa*: *R.A.M.*, xiii, p. 33], the disease being particularly severe on a late local variety, 'Bolana'. Flowering began normally, but once the flowers had opened completely their development became arrested and they withered in a few days. On all the trees the extremities of some of the branches dried up.

The control measures recommended consist in the removal of all infected material in spring and winter and spraying with 1 per cent.

Bordeaux mixture or a solution of Caffaro powder at the strength of 1 kg. to 100 l. of water [ibid., xii, p. 707], when the buds swell and again when the flowers are about to open.

McNew (G. L.) & Bliss (D. E.). **Control of Cherry yellow-leaf on nursery stock.**—*Bull. Ia agric. Exp. Sta.* 332, pp. 155–184, 9 figs., 10 graphs, 1935.

In spraying and dusting trials [which are described and the resulting data tabulated] conducted in Iowa with numerous fungicides against *Coccomyces hiemalis* on cherry nursery stock [*R.A.M.*, xiv, p. 497], only home-made Bordeaux mixture (4–6–50) gave consistently profitable results. The evidence obtained showed that the trees should be sprayed at approximately 10-day intervals (frequency depending on the weather conditions) from the time the plants are 6 to 12 in. high until the growing season is over. The best dust tested was kolodust, which in 1931, when the rainfall was light, gave as good results as Bordeaux mixture.

Pittman (H. A.). **Fig leaf mottle.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xii, 2, p. 196, 1935.

Figs in Western Australia are becoming every year more widely attacked by a leaf mottle, characterized by a mosaic-like pattern of light green or yellowish and dark green patches, frequently accompanied by distortion and malformation. The first crop of figs often falls prematurely, and occasionally the development of much of the second crop is curtailed. The cause of the disease has not been determined but considerable improvement is effected by adding 1 to 4 lb. (according to the size of the tree) of finely crushed copper sulphate to the soil, applying it all round the tree at a distance of about 1 ft. from the trunk, as far out as the branches extend. The treatment should be carried out preferably in autumn after the heavy rains have started, but it can be applied at any other time, provided the soil is moist. Subsequent applications at one-quarter the rate of the first should be made each succeeding autumn.

Nattrass (R. M.). **Diseases of the Olive.**—*Cyprus* (*agric.*) *J.*, xxx, 2, pp. 55–57, 1935.

Olives in Cyprus are not severely affected by diseases, those most commonly present being leaf spot or blotch (*Cycloconium oleaginum*) [*R.A.M.*, xii, p. 522], sooty mould [cf. ibid., vii, p. 187], Dalmatian disease (*Macrophoma dalmatica*) [*Sphaeropsis dalmatica*: ibid., xiii, p. 587; xiv, p. 83], and olive knot [*Pseudomonas savastanoi*: ibid., xiv, p. 643], of which only the last is of much importance. Leaf spot can be controlled by spraying with Bordeaux mixture before flowering and after the fruit has been picked, though this is seldom necessary or profitable; the trees should be pruned to let in air and light, should not be planted in low-lying, undrained localities, and should not be given any excess of nitrogenous manures. Dalmatian disease may also be controlled by the same methods and precautions. Against olive knot no direct treatment is known [cf. ibid., xii, p. 522]; when a grove is planted, all the planting stock should be free from galls,

similar care being taken when grafting with the scions. Once the trees have become attacked the twigs and branches bearing the galls should be excised, the cuts being made well below the gall to avoid contamination of the knife. The removal of galls, as well as ordinary pruning, should be effected in summer when no bacterial exudation is present. Branches that rub against one another should be removed, and the fruit picked with as little damage to the tree as possible.

HORNE (W. T.). **Avocado diseases in California.**—*Bull. Calif. agric. Exp. Sta.* 585, 72 pp., 34 figs., 1934. [Received August, 1935.]

In this useful and well-illustrated bulletin the author gives a comprehensive account of the major parasitic diseases and physiological troubles of the avocado pear in California, among which the following may be mentioned: sun blotch [*R.A.M.*, xi, p. 314]; sooty spots on green stems, leaves, and fruits, caused by a species of *Helminthosporium*; anthracnose or withertip, believed to be caused by *Colletotrichum gloeosporioides* [ibid., xiii, p. 456]; stem and root cankers which experiments indicate to be probably caused by *Phytophthora cactorum*, *P. parasitica*, or *P. citrophthora*; root rot (*Armillaria mellea*); blast of immature fruits (*Bacterium* [*Pseudomonas*] *syringae*) [ibid., x, p. 96; xii, p. 376]; and rots of harvested fruits associated with *Rhizopus nigricans*, *Botryosphaeria ribis* [var.] *chromogena* [cf. ibid., xii, p. 633], *C. gloeosporioides*, and other miscellaneous organisms, including species of *Alternaria*, *Cladosporium*, *Fusarium*, *Pestalozzia*, *Penicillium expansum*, and *Phytophthora citrophthora*. Control measures are suggested whenever information is available.

ROARK (R. C.). **Insecticides and fungicides.**—*Industr. Engng Chem.*, xxvii, 5, pp. 530–532, 1 map, 1935.

This article is concerned mainly with insecticides, but the following references are made to the use of fungicides for checking fungal and bacterial injuries to plants, &c., in the United States, where the losses from these sources are estimated at $1,000,000,000 per annum [cf. *R.A.M.*, xiv, p. 461]. During 1934 the approximate consumption in the United States of some standard disinfectants was as follows: lime-sulphur (dry) 43,000,000 lb., sulphur dust 30,000,000 lb., creosote oil 10,000,000 galls., petroleum oil 20,000,000 galls., copper sulphate 12,000,000 lb., zinc chloride 18,000,000 lb., and sodium fluoride 4,000,000 lb.

Copper, mercury, zinc, and sulphur have remained the only fungicides in general use for half a century. The usefulness as seed disinfectants of the organic compounds of mercury is restricted by their high toxicity to man [ibid., xiv, p. 552]. Attention is directed to the strong bactericidal capacity of various alkyl phenols [ibid., xiv, pp. 584, 632], which might serve equally well as fungicides.

**Kemiska medel i växtparasitbekämpningens tjänst.** [Chemical preparations for the control of plant parasites.]—*Flygbl. Växtskyddsanst., Stockh.* 12, 11 pp., 1 diag., 1934. [Received August, 1935.]

This is a revised edition of pamphlet No. 4 in the same series [*R.A.M.* xiii, p. 112], dealing in popular terms with the composition and applica-

tions under Swedish conditions of some standard fungicides and insecticides, exclusive of those employed in the treatment of seed-grain [see above, p. 687].

Frost (K. R.). **The design of a double-piston pressure regulator for spray pumps.**—*Agric. Engng St. Joseph, Mich.*, xvi, 6, pp. 227-228, 1 fig., 1 diag., 1 graph, 1935.

Details are given of a double-piston pressure regulator for orchard spray pumps [cf. *R.A.M.*, xiii, p. 113; xiv, p. 369] which has been devised in California to remedy various defects inherent in the standard type. The new regulator is stated to lower the by-pass pressure and h.p. consumption to 50 per cent. of that ordinarily required. It is simpler to use since there is no need to compress the spring, or adjust the valve stem for clearance, as in the standard type. A saving of trouble and expense should also result from the large by-pass apertures and the elimination of ball valves and stems liable to abrasion and corrosion.

Wilson (J. D.) & Runnels (H. A.). **The relation of time to the effect of Bordeaux mixture on transpiration.**—*Bi-m. Bull. Ohio agric. Exp. Sta.* 174, pp. 120–124, 2 graphs, 1935.

Continuing their studies on the effect of Bordeaux mixture on the transpiration of sprayed plants [*R.A.M.*, xiv, p. 459], the authors give an account of laboratory experiments, the results of which showed that in *Coleus* plants a marked increase in transpiration occurred immediately after the drying of the spray on the leaves, in many instances the increase becoming greater each following night for at least four nights. In one series the maximum increase occurred on the fourth night after spraying, regardless of whether the plants were sprayed with freshly prepared or four-day-old Bordeaux mixture, but the latter material did not cause as great an increase as the former. The effect decreased rapidly from the fifth to the eighth night, and more gradually from the ninth to the twelfth, on which the sprayed plants still lost more water than the controls.

Bessey (E. A.). **A text-book of mycology.**—xv+495 pp., 139 figs., Philadelphia, P. Blakiston's Son & Co., Inc., 1935.

In this work, which aims at providing first-year students in mycology and plant pathology with some idea of the structure, life-history, and classification of the more important fungi, the physiological aspects of the subject-matter are subordinated to the morphological, ontogenetical, and systematic. Attention is given to recent studies on sexuality, one chapter consists of a bibliographical guide to the literature of identification, and each includes a section on phylogeny and a bibliography of its subject-matter. Most of the illustrations are from recent works.

Wollenweber (H. W.) & Reinking (O. A.). **Die Fusarien; ihre Beschreibung, Schadwirkung und Bekämpfung.** [The *Fusaria*; their description, injurious effects, and control.]—viii+355 pp., 95 figs., Berlin, P. Parey, 1935.

The first half (pp. 1–141) of this valuable and welcome book is devoted to the systematics of the genus in the restricted sense as

delimited by the senior author in his earlier monograph [cf. *R.A.M.*, x, p. 626]. Critical descriptions are given of the 65 species, 55 varieties, and 22 forms in all of the 16 groups into which the genus has been divided [loc. cit.], together with the related known perfect stages. Keys are provided for each group.

Further experience of the range of variability of some of the type species has resulted in a reduction of the number of forms. In the *Roseum* group, *Fusarium herbarum* on grounds of priority has been merged in *F. avenaceum* of which two varieties and one form are recognized. Some forms of varieties of *F. lateritium* are no longer maintained. In the group *Elegans* the three sub-groups *Orthocera*, *Constrictum*, and *Oxysporum* are retained but some of the agents of vascular wilt diseases are transferred from 'forms' to varieties, e.g., the cause of banana wilt is recorded as *F. oxysporum* v. *cubense* instead of *F. oxysporum* forms 3 and 4. In the group *Liseola* the varieties '*majus*' and '*erumpens*' are now merged in *F. moniliforme*, the perfect stage of which is recorded as *Gibberella fujikuroi* (Saw.) Wr. with *G. moniliformis* (Sh.) Winel. as a synonym.

In the second half of the book (pp. 142–316) descriptions are given of the *Fusaria* as the cause of diseases of plants, the botanical names of the hosts being arranged in alphabetical order. The most serious diseases are treated in considerable detail and references to the more important papers are given under each host. This part of the book will be especially welcome to plant pathologists.

A very complete list of the synonyms and homonyms of the genus in the alphabetical order of the species precedes a full and convenient index (with the main page references in thick type).

Molander (A. R.). **Nya iakttagelser över förekomsten av Zostera marina utmed svenska kusten.** [New observations on the occurrence of *Zostera marina* along the Swedish coast.]—*Ny svensk Fiskeritidskr., 1934*, 21, pp. 243–245, 1934.

Particulars are given of the condition of *Zostera marina* in Swedish waters in relation to the wasting disease [*R.A.M.*, xiv, p. 600]. Along the Bohuslän coast extensive destruction has taken place, but there are indications of recovery, especially in relatively fresh water. No sign of deterioration has been detected from the Warberg tract to the Sound, a noteworthy fact in view of the Danish reports as to the occurrence of wasting along the Kattegat and Skagerack [ibid., xiv, p. 326]. Hydrographic factors are considered probably to account for this distribution, the salinity of the Swedish coastal waters being reduced by a freshening influx from the Baltic which counteracts the tendency to wastage.

Gaschen (H.). **Présence de flagellés dans le latex d'une Apocynacée d'Indochine.** [The presence of flagellates in the latex of one of the Apocynaceae of Indo-China.]—*C.R. Soc. Biol., Paris*, cxix, 19, pp. 356–357, 1935.

Attention is drawn to the presence in the stems of *Strophanthus balansac*, a laticiferous member of the Apocynaceae, growing in calcareous soil on a rocky mountain slope in Tonkin, Indo-China, of

flagellates of the genus *Leptomonas*, the bodies measuring on an average 13·9 $\mu$ and the flagella 8·2 $\mu$ [cf. *R.A.M.*, v, p. 760: xiii, p. 254]. In common with other plant flagellates, the species under observation is characterized by torsion of the body on its longitudinal axis and a small blepharoplast from which the flagellum is detached directly.

Ghimpu (V.). **Infinitul mic in patologia vegetala : ultravirusurile fitopatogene.** [The infinitely small in plant pathology: plant pathogenic ultraviruses.]—Reprinted from *Viața agric.*, *1935*, 5, 10 pp., 13 figs., 1935.

This is a brief, semi-popular review of our present knowledge of the virus diseases of crop plants, most of which has been noticed from time to time in this *Review*. Reference is made to the economic importance of the diseases for some of the major crops in various parts of the world.

Reed (H. S.) & Frémont (Thérèse). **Factors that influence the formation and development of mycorrhizal associations in Citrus roots.**—*Phytopathology*, xxv, 6, pp. 645-647, 1 fig., 1935.

Continuing their investigations in California on the factors involved in the mycorrhizal infection of orange trees [*R.A.M.*, xiii, p. 764], the writers found that roots growing in soils deprived of fertilizers for the preceding seven years showed little capacity to resist invasion or digest the intracellular hyphae, so that in such cases the endophyte behaved as a true parasite. It developed principally in the form of intercellular mycelium, sending into the cortical parenchyma cells short, sparsely branched hyphae differing little from the intercellular ones and with their ends often in contact with the nuclei. Where sodium nitrate was the only fertilizer applied there was no development of the 'mycorrhiza cells', in which infection is followed by digestion, the cortical cells were abnormally large and reacted in an exaggerated way to penetration by the endophyte, and the trees were generally unthrifty, suffering severely from 'mottle leaf' [ibid., xiv, p. 628]. Profound metabolic disturbances were indicated by the accumulation of phenolic precipitates in the root cells, and there was no evidence of a beneficial association between host and fungus.

In soils adequately fertilized with organic nitrogen in appropriate forms root infection occurs mainly during growth in the spring, whereas the roots of unfertilized trees contain the endophyte at all seasons. In the former there was comparatively little intracellular mycelium other than the arbuscles, and the entry of the fungus appeared to promote an active response in the cell, the cytoplasm of which became spongy, enveloped the arbuscles, and was rich in mitochondria.

Hansen (H. N.) & Smith (R. E.). **The origin of new types of imperfect fungi from interspecific co-cultures.**—*Zbl. Bakt.*, Abt. 2, xcii, 8-12, pp. 272-279, 5 figs., 1 diag., 1935.

Following a brief account of their production of heterogenic types of *Botrytis cinerea* by the mixture of two homogenic strains of the fungus in the same culture [*R.A.M.*, xii, p. 316], the writers give details of similar experiments in which *B. allii* [ibid., ix, p. 82; xii, p. 109;

xiv, p. 553] and *B. ricini* were grown in 'co-cultures' (intentional mixtures or combinations of different types of organism in one culture) on potato-dextrose agar and their progeny analysed by single-spore methods through successive generations.

Of 20 monospore isolations from the original mixed culture, 6 were identical with *B. allii*, 9 with *B. ricini*, and 5 quite distinct from either. From these aberrant cultures three types were segregated by repeated single-sporing and selection that appeared sufficiently different from the parents to warrant varietal or even specific rank. These types have remained constant through five monospore culture series. Gene changes induced in some way, not yet fully elucidated, by interspecific anastomosis are thought to be responsible for the production of aberrant homotypes in *Botrytis*.

Corner (E. J. H.). **Observations on resistance to powdery mildews.** — *New Phytol.*, xxxiv, 3, pp. 180–200, 2 figs., 1935.

A summarized account is given of investigations in 1928 at Cambridge to determine the stage at which infection by the powdery mildews of cereals (*Erysiphe graminis*) [*R.A.M.*, xii, p. 620; xiii, p. 719], the apple (*Podosphaera leucotricha*) [ibid., xiv, p. 639], and the rose (*Sphaerotheca pannosa*) is checked on resistant varieties of the host plants. It was shown that on susceptible hosts (Wilhelmina wheat, Spratt Archer barley, and *Agropyron repens*) the conidia of *E. graminis* germinate by producing from near one end a straight or somewhat flexuous, clavate, primary germ-tube, 20 to 40 by 3 $\mu$ at the base to 4·5 to 6 $\mu$ at the apex, which, after having established a haustorium close to or at its apex, continues its apical growth as an ordinary hypha. The original 'germ-tube portion' becomes the first cell, and haustoria are subsequently formed from the third, fourth, or fifth cells of the hypha, rarely, if ever, from the second. At the same time, two to four secondary germ-tubes arise from near the ends of the conidium, which develop into hyphae and produce haustoria from their third to fourth cells, rarely from the second, and apparently never from the first. The short, tapering, tertiary germ-tubes, which may also arise from any part of the conidium, are generally abortive; old conidia may only produce these, and some of them may form abortive haustoria. Two to five laterals subsequently develop from the cell which was the primary germ-tube.

At the end of 24 hours from inoculation, at about 20° C. and in a saturated atmosphere, penetration of the host cells is just beginning, and after 48 hours the first haustoria are more or less fully grown and one or two secondary germ-tubes may have been formed. After 72 hours a fairly extensive mycelium has developed, and after 96 hours conidial chains are produced. The cell wall is penetrated and the haustorium develops in the way described by Grant Smith (*Bot. Gaz.*, xxix, p. 153, 1900) and Foëx [*R.A.M.*, iv, p. 152]. A stylar process from the germ-tube pierces the cuticle (which is not micro-chemically affected), and its passage through the cellulose layer, clearly altered around the point of penetration, is preceded by a local internal swelling of the layer into a papilla; this is eventually pierced at the apex by the process, whereupon the haustorium gradually enlarges into the mature organ. On the partially resistant Norka wheat, germination

of *E. graminis* conidia proceeded normally for 24 to 36 hours, up to the formation of the infection papilla, after which penetration was usually checked and the conidium and germ-tube died. In a few cases, however, a small haustorium was formed, a small infection focus developing slowly for five or six days, after which it died off. In three cases, which were not studied further, a normal mycelium with full-sized haustoria developed exactly as on the susceptible hosts, and conidia were produced after 120 hours. On the resistant Black Persian wheat the conidia germinated as described above and the germ-tubes developed to the papilla stage, but neither haustoria nor secondary germ-tubes were formed, and the conidia gradually died.

The same sequence of events also applied to the germination and development of *P. leucotricha* and *S. pannosa* on susceptible and resistant varieties of apple and rose, respectively.

The results of cross-inoculations with the physiologic forms of *E. graminis* from wheat, barley, and *A. repens*, as well as inoculation experiments with *P. leucotricha* and *S. pannosa* (corroborated by a few tests with *Oidium euonymi-japonici* and *E. cichoracearum*) on inappropriate hosts showed that in every case the conidia germinated and initiated penetration to the papilla stage, when the process was stopped and no haustoria were formed. These results are considered to indicate that the tip of the germ-tube and the appressoria must respond thigmotropically to contact with the epidermis of the host, there being as yet no evidence for positive chemotropism. The penetration of the cuticle is evidently mechanical, while that of the cellulose layer is both mechanical and chemical. The whole investigation is interpreted to indicate that resistance to the powdery mildews is primarily caused by toxins in the host cell, but that environmental and structural factors may also be operative, at least in cases of subinfection.

Kaliaeff (A.), Kravtchenko (A.), & Smirnova (Mme N.). **Zum Problem der erworbenen Immunität bei Pflanzen. Vakzination der Bohnen gegen den Pilz Toile.** [A contribution to the problem of acquired immunity in plants. Bean 'vaccination' against the 'toile' fungus.]—*Zbl. Bakt.*, Abt. 2, xcii, 8–12, pp. 209–220, 1935.

By means of the addition to soil or water cultures of Phoenix, Golden Rain, and Mitchinskaia beans [*Phaseolus vulgaris*] of the filtrate from a bouillon culture of the 'toile' fungus (*Botrytis cinerea*) [*R.A.M.*, xiv, p. 188], it was possible, at the Moscow Microbiological Research Institute, to induce enhanced resistance to subsequent infection. In one of the experiments described the plants were germinated on filter paper and then transferred to flasks containing Knop's nutrient solution. To some of the flasks 10 per cent. of an undiluted filtrate from a four-week-old culture of *B. cinerea* on malt bouillon was added, while others (controls) received no addition. Eight days later the plants were transferred to fresh Knop's solution (without culture filtrate), and after another four days all were inoculated by inserting a piece of mycelium from a four-day-old culture of the fungus and kept for two or three days in a moist chamber before uncovering. In 13 days after inoculation 32 of the 84 'vaccinated' plants had collapsed from the attack of the fungus (38 per cent.), while 66 of the 81 controls had

collapsed and another 10 wilted without rotting, or 93·8 per cent. in all. The average survival figures for 'vaccinated' and control plants in the several experiments described were 42·2 and 4·3 per cent., respectively, in a total of 283 'vaccinated' and 235 control plants, and the deaths occurred earlier in the latter. The resistance of the treated plants was not impaired by the arrested growth and damaged root system caused by 'vaccination', which at the same time conferred a heightened vitality expressed in the vigorous development of the cambium, protoxylem, and in some cases of the pericycle. The most intense reaction to 'vaccination' was manifested by plants that had survived infection. Both the untreated and 'vaccinated' plants succumbing to the attacks of the fungus (90·2 and 55·1 per cent., respectively, in all series, excluding those that wilted without rotting) were characterized by the virtual absence of secondary cambium. The cambium of the 'vaccinated' plants that survived formed a closed ring of several layers at a time when that of the controls was still incomplete.

Carbone (D.) & Alexandri (A. V.). **Recherches sur les anticorps chez les végétaux.** [Researches on antibodies in vegetables.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 6, pp. 221–223, 1935.

After referring to the failure of earlier investigations on plant immunity to demonstrate the presence of antibodies in plants inoculated with various bacteria [*R.A.M.*, v, p. 347; vi, p. 110; x, p. 689; xii, p. 496 *et passim*] the authors state that they repeated the series of experiments described by Mlle T. Frémont as giving positive results [ibid., xiv, p. 78], inoculating cultures of *Bacterium* [*Bacillus*] *proteus vulgaris* and *Bact. prodigiosum* [*Bacillus prodigiosus*] into the pith cavity of broad beans [*Vicia faba*], haricot beans [*Phaseolus vulgaris*], and lentils at 1-, 2-, and 3-day intervals, and extracting, centrifuging, and filtering the cellular fluid. Repeated attempts, however, to show the presence of agglutinins by Frémont's method, using an emulsion of living bacteria in a physiological solution, and of precipitins by adding the plant extracts to the filtrates of the bacterial cultures, all gave negative results.

Spooner (E. T. C.) & Bawden (F. C.). **Experiments on the serological reactions of the Potato virus 'X'.**—*Brit. J. exp. Biol.*, xvi, pp. 218–230, 2 figs., 1935.

The results of the serological studies briefly reported in this paper showed that the saps of tobacco (White Burley), *Nicotiana glutinosa*, *Datura stramonium*, and potato (President and Up-to-Date) infected with the potato virus X [*R.A.M.*, xiv, p. 605] contain a common antigen obtainable in stable suspension by MacClement's purification method [ibid., xiii, p. 647], which gives virus preparations of high infectivity. The antigen flocculates and fixes complement with the sera of rabbits inoculated with the sap of infected potatoes, either crude or purified by carbon dioxide, but not with normal rabbit serum or the sera of rabbits inoculated with healthy tobacco sap. The anti-virus sera in 1 in 10 dilution neutralized the infectivity of purified virus suspensions, whereas anti-healthy-tobacco and normal

rabbit sera did not. Both anti-virus and anti-healthy-tobacco sera were shown to contain small quantities of antibodies to normal tobacco antigens, the presence of which was not demonstrable in purified virus preparations, and the normal antigen was found to be common to healthy tobacco and healthy *D. stramonium* leaves.

The investigation also indicated that the virus antigen is specific to the potato virus X and to the closely related potato virus 'D' [ibid., xiv, p. 329], as it was not found to be present in the sap of tobacco infected with the other tobacco or potato viruses studied. It is closely associated with the infectivity of the virus, since both were removed by the same grade of collodion membranes. No antigenic differences were found between different strains of the X virus.

PORTER (D. R.). **Relation of virus diseases to Potato production in California.**—*Bull. Calif. agric. Exp. Sta.* 587, 32 pp., 13 figs., 6 diags., 1935.

After a brief, popular account of the virus diseases of potatoes and their economic importance in California, details are given of investigations started in 1929 to test the possibility of developing healthy potato seed production in that State by the tuber indexing (tuber-unit) system [*R.A.M.*, xiv, p. 525, the technique of which is briefly described]. The results showed that in many districts masking of the symptoms of certain of the virus diseases is common, this rendering effective roguing practically impossible. In every district examined the virus diseases spread rapidly during one growing season, unless the seed plot was well isolated or the planting was delayed until the middle of June or later. Control of the insect vectors was found to be insufficiently beneficial to warrant its use in practice. Comparatively little field spread of the diseases occurred when plants were grown during periods of extreme heat, common in the interior of California from June to September, but owing to the symptom-masking effect of heat, the seed used in planting must be practically free from the virus diseases. Potentially high-yielding seed may be produced in the California Delta by planting in March or April in plots carefully isolated from external infection.

HITCHCOCK (J. A.). **The economics of certified seed Potato production I. The seed Potato enterprise.**—*Bull. Vt agric. Exp. Sta.* 370, 36 pp., 7 graphs, 2 maps, 1934. [Received August, 1935.]

Certification of seed potato stocks on the basis of field inspection of the growing crop, with a view to the elimination of seed-borne (especially virus) diseases [cf. preceding abstract] was inaugurated in Vermont in 1914, and underwent rapid expansion from 1918 to 1922, since when its development has been slow. To determine the conditions and methods of management promoting successful potato cultivation and to appraise the possibilities of the latter in the State are the objects of a study of which this bulletin reports a part of the results.

The data used comprise 359 seed potato enterprise records secured by the survey method, 119 for 1928, 127 for 1929, and 113 for 1930, representing in all 218 farms. The average cost of growing and harvesting an acre of potatoes was estimated at $158 in 1928, $156 in 1929,

and $171 in 1930. The average yields for the three years were 210, 245, and 310 bushels, respectively, making the average cost per bushel of marketable potatoes 74, 63, and 54 cents. Spraying and dusting materials accounted for 7 per cent. of the total expenditure, machinery (chiefly spraying and dusting equipment) and miscellaneous items (including seed disinfectants and inspection fees), 6 per cent. each.

THOMSON (R.). **Potato-growing in New Zealand. Part I. Advice to growers in regard to the maintenance of pure and healthy seed stocks.**—*N.Z. J. Agric.*, l, 5, pp. 257–268, 4 figs., 1935.

After briefly reviewing the work of the Department of Agriculture, New Zealand, in inaugurating a system of potato seed certification [*R.A.M.*, vii, pp. 389, 736], the author gives brief directions for the maintenance of pure and healthy seed stocks by roguing, and adds short, popular descriptions of the prevalent virus diseases, viz., leaf roll, mosaic, crinkle, stipple-streak, and spindle sprout, as well as of other conditions adversely affecting the crops, as an aid to their recognition. Recommendations are made for applying fertilizers and handling the seed.

HÜLSENBERG (H.). **Beobachtungen zum Auftreten des Kartoffelkrebses.** [Observations on the occurrence of Potato wart.]—*Mitt. Landw., Berl.*, l, 17, pp. 359–360, 1935.

The writer briefly discusses various difficulties involved in the enforcement of the regulations against potato wart [*Synchytrium endobioticum*] in the Prussian district of Schleusingen in the Province of Saxony [*R.A.M.*, xiii, p. 544]. The ignorance of the local peasantry is largely responsible for the widespread reluctance to procure certified seed of immune varieties, suspicions as to the genuineness of which have also been aroused by the dealings of unscrupulous traders. Involuntary confusion of immune and susceptible varieties is further apt to arise through the similar appearance, especially as regards skin colour, of both groups, and the restricted storage facilities do not permit of adequate separation. It is considered to be urgently necessary to educate the rural population in this matter.

VAN EVERDINGEN (E.). **Het verband tusschen de weergesteldheid en de Aardappelziekte (tweede mededeeling).** [The relation between weather conditions and Potato blight (second note).]—*Tijdschr. PlZiekt.*, xli, 6, pp. 125–133, 1935.

Continuing his studies on the relation between weather conditions and potato blight [*Phytophthora infestans*: *R.A.M.*, v, p. 627], the writer finds that, in general, the results of observations covering the period from 1928 to 1933 confirm his previous data regarding the critical factors in the inception and development of epidemics [see above, p. 676].

In 1932, 1933, and 1934 the critical days in Holland numbered 15, 13, and 18, respectively. The mean minimum humidity in the dry year 1934 (when a number of the critical days were not followed by an outbreak of blight) during the week following the critical days was only 61 per cent., the corresponding figures for 1933 and 1932 being

68 and 61 per cent., respectively. The average duration of sunshine for the four days following the critical ones in 1934 was 27 hours, as compared with 18 and 21 in 1933 and 1932, respectively. Assuming light winds to be conducive to the spread of blight, 7 to 8 of the 15 critical days in 1932, 9 to 10 of the 13 in 1933, and 7 to 8 of the 18 in 1934 may be regarded as favourable, but the whole problem of wind velocity in relation to the disease requires further investigation.

Recent foreign literature on the meteorological aspects of potato blight is concisely summarized and discussed, with special reference to the work of Beaumont (*Rep. agric. met. Conf., Minist. Agric.*, p. 12, 1931) [cf. also *R.A.M.*, xi, p. 559] and Wiltshire [ibid., xi, p. 123] in England, and of Crosier [ibid., xiii, p. 724] and others in the United States. The author agrees with Wiltshire that further studies should be directed to an examination of the factors of sunshine, wind, and humidity in the potato fields themselves.

Mader (E. O.) & Blodgett (F. M.). **Potato spraying and Potato scab.**—*Amer. Potato J.*, xii, 6, pp. 137–142, 1935.

For the past two years a marked reduction in the incidence of potato scab [*Actinomyces scabies*] at Pittsford, New York, has been obtained in certain fields by spraying with Bordeaux mixture (from 27 to 7·8 and from 38·8 to 4·4 per cent. in two tests in 1934). Various explanations of this unexpected result (which was incidental to a study of the effect of the fungicide on foliage and tuber development) are offered. Spraying may have delayed tuber-setting and enlargement until a period of relatively high soil moisture, thereby reducing the amount of infection, a probable consequence also of the higher total nitrogen and copper content of the sprayed plants. Schaal has recently shown that flea-beetle [*Epitrix cucumeris*] larvae may act as vectors of *A. scabies* [*R.A.M.*, xiv, p. 118], inoculation of the tubers with which would be automatically reduced by treatment inimical to the insects. The wilting of sprayed plants in hot weather [ibid., xiv, p. 460] may induce a general 'hardening' conferring resistance to scab.

Coupan (G.). **Appareils pour le poudrage de la Pomme de terre.** [Potato-dusting apparatus.]—*J. Agric. prat., Paris*, N.S., xcix, 29, pp. 55–57, 1935.

Details are given of the construction and application of a number of knapsack and traction potato-dusting apparatus exhibited and tested at Rennes (Ille-et-Vilaine) on 7th and 8th June, 1935. The potatoes were treated with 'Standard' copper-arsenic dust. The following are the deliveries and area covered per hour by the different machines. (A) Knapsack: (1) Stella (P. Perras, Belleville-sur-Saône, Rhône) 16 kg., 0·18 hect.; (2) Vermorel (Villefranche-sur-Saône, Rhône) Blufina and (3) Bluette, 21 kg., 0·19 hect. and 28·5 kg., 0·21 hect., respectively; (4) Berthoud (Belleville-sur-Saône) high delivery, 31 kg., 0·22 hect. (B) Traction without motor: (1) Berthoud Flux, 28 kg., 1·21 hect.; (2) Vermorel Aquilon, 19 kg., 1·10 hect. (C) Motor traction: Herzog (Jouzac, Charente-Inférieure), 34 kg., 2·17 hect. The criticisms of the judges on the various types of apparatus are briefly summarized.

Chamberlain (E. E.). **Verticillium-wilt of Potatoes. Its relation to stem-end discoloration of the tubers, and suggested measures for control.**—*N.Z. J. Agric.*, l, 6, pp. 321–327, 3 figs., 1935.

After a brief reference to the considerable reduction in the yield of potato crops in New Zealand caused by the *Verticillium albo-atrum* wilt [*R.A.M.*, xiv, p. 466], the author gives details of experiments, the results of which showed that there is little correlation between the discoloration of the vascular system in the stem-end of potato tubers and the presence in the latter of *V. albo-atrum* mycelium. Such discolorations should not, therefore, be used to determine the percentage of infection with wilt in a line of potatoes used as seed. Another series of experiments indicated that counts of wilted plants in the field is the most reliable method so far found for determining the amount of wilt in a crop, although it does not give the real percentage of tuber infection, which may vary considerably from one season to another.

It is suggested that the most effective method for the elimination of the disease, with particular reference to seed plots, is a three- or four-year crop rotation, together with the roguing of infected plants, including the plants on either side of the diseased one.

Ehrke (G.). **Untersuchungen über die Eisenfleckigkeit der Kartoffel.** [Investigations on 'Eisenfleckigkeit' of the Potato.]—*Biochem. Z.*, cclxxviii, 3–4, pp. 195–225, 3 figs., 1 diag., 9 graphs, 1935.

The writer's extensive researches [the methods and results of which are fully described and tabulated] showed that among the biochemical and metabolic changes induced in Datura, Konsum, Erdgold, Sickingen, and Sämling [Seedling] potato tubers by 'Eisenfleckigkeit' in Berlin [*R.A.M.*, xiv, p. 389] are an increase in the oxidase and peroxidase, glutathion, manganese, and iron contents, as well as in fermentative and diastatic activity, and a decrease in dry weight, albumin, starch, and ascorbic acid. Under equable weather conditions the disease failed to develop in the progeny even of severely infected tubers on the light, sandy soils favouring its occurrence, whereas abnormal fluctuations produced the symptoms even in plants from healthy tubers. In heavy soils, on the other hand, the plants remained healthy, even where the seed tubers were diseased and the weather was conducive to the appearance of the disorder.

Dastur (J. F.). **Diseases of Pan (Piper betle) in the Central Provinces.**—*Proc. Indian Acad. Sci.*, i, 11, pp. 778–815, 3 pl., 4 figs., 1935.

After a review of the various methods of cultivation of the betel vine (*Piper betle*) in the Central Provinces and Berar (India), the author gives a detailed account of the most important diseases of the crop there. The chief is a foot rot which is known to occur in epidemic form in many parts of the Central Provinces and some parts of Berar, and is caused by a strain of *Phytophthora* considered to be a new variety of *P. parasitica* [cf. *R.A.M.*, xiv, p. 122] which is named var. *piperina*; it differs from the type species in its larger oogonia (20·4 to 40·8 $\mu$, average 33·4 $\mu$, in diameter) and its larger oospores (17·8 to 53·1 $\mu$, average 20·1 $\mu$). The fungus readily infected seedlings of *Ricinus communis*, *Vinca rosea*, and *Martynia diandra*, but not *Colocasia antiquorum*. In a few localities of the Central Provinces the fungus also causes a serious leaf rot of betel vines.

In Timarni (Hoshangabad district) a destructive foot rot was found to be caused by an apparently hitherto undescribed species of *Pythium*, which is named *P. piperinum*, with an English diagnosis. It is characterized by globular, non-papillate sporangia measuring 12·5 to 20·4 μ (average 16·4 μ) in diameter. The zoospores are formed either inside or outside the sporangia (discharge occurs either through an opening in the sporangial wall or through a discharge tube) and are at the most 12 in number, spherical, generally uni- but sometimes bi-ciliate, and measure 3·4 to 5·1 μ (cilia 4·6 to 10·1 μ in length). The oogonia are spherical or sub-spherical, terminal, lateral, or intercalary, smooth, thin-walled, hyaline, and 15·3 to 25·5 μ (average 19·3 μ) in diameter. The antheridia are one to many per oogonium, borne terminally or laterally on a separate hypha or on the oogonium-bearing hypha. The oospores (invariably only one per oogonium) are smooth, thick-walled, hyaline or slightly yellow, spherical, almost filling the oogonium, and 12·75 to 20·4 μ (average 16·6 μ) in diameter; they are formed after fertilization or parthenogenetically.

A destructive anthracnose caused by two unidentified species of *Colletotrichum* was found in only a few centres in the Central Provinces. Experiments showed that the foot rots could be controlled by treating the soil round the bases of the plants with Bordeaux mixture [ibid., xi, p. 283], and the anthracnose by spraying the plants with Bordeaux mixture or bouisol [ibid., xiv, p. 533].

Isolations from foot rot-affected plants also yielded *Sclerotium rolfsii*, *Rhizoctonia bataticola* [*Macrophomina phaseoli*], and *R.* [*Corticium*] *solani*, but the evidence indicates that these fungi are only weakly parasitic and do not cause much damage to betel vines.

Summers (E. M.) & Rands (R. D.). **Losses due to planting of mosaic diseased seed Cane.**—*Sug. Bull.*, xiii, 15, pp. 2–6, 1935.

The field spread of sugar-cane mosaic in Louisiana [*R.A.M.*, xiv, p. 394] is stated to have reached epidemic proportions during the last two years, coincident with the rapid extension in the cultivation of the susceptible Co. 281 variety. Co. 290 is also gradually contracting a severe type of infection, whereas C[anal] P[oint] 807 and 28/19 have remained almost uniformly immune from the disease, the chief losses from which thus fall on the extensive areas of Co. 281 and P.O.J. 234.

The writers' data indicate that both syrup- and sugar-producers run the risk of heavy losses from the planting of infected seed-cane; in the case of Co. 281 seed pieces should be procured exclusively from areas showing less than 5 per cent. mosaic. Great importance is attached to the rehabilitation of Co. 281, the outstanding qualities of which, including resistance to red rot [*Colletotrichum falcatum*: ibid., xiv, p. 470], do not appear to be shared by any of the mosaic-immune varieties.

Caminha (A.). **Co. 290 Cane at Campos, Brazil. Observations on Cane culture in Brazil.**—*Brasil Assuc.*, v, 3, pp. 127–138; 4, pp. 335–341, 1935. [? Portuguese. Abs. in *Facts ab. Sug.*, xxx, 8, pp. 304, 305, 1935.]

Contrary to the results obtained in other districts, the Co. 290 sugar-cane variety is stated to have done well at the Campos Experimental

Station, Brazil. Though susceptible to mosaic [see preceding abstract], it is more tolerant of the disease than Co. 213, besides being resistant to various forms of root rot [*R.A.M.*, xiv, p. 532]. Generally speaking, the mosaic problem in Brazil [ibid., ix, p. 807] has been solved by the introduction of certain Java varieties, of which P.O.J. 36 and 213 have transformed the São Paulo sugar industry during the last eight years. In 1925 the production in that state had fallen to 220,000 sacks (of 60 kg.), due to mosaic and traditional methods of cultivation; by 1933 it had risen to 2,400,000 sacks. In Rio de Janeiro the average cane yield in 1927 was 25 tons per hect., with a factory yield of 7·5 per cent. sugar, while the corresponding figures in 1934 were 60 tons and 9·5 per cent., respectively. Both P.O.J. 36 and 213 are best adapted to the comparatively temperate zones, such as São Paulo and Argentina [ibid., xiv, p. 394], and readily lose their resistance to mosaic (especially P.O.J. 36) in hot, humid climates. P.O.J. 979 may exhibit mosaic symptoms from the time of germination and is tolerant of the disease up to the age of four or five months, after which period it gradually acquires resistance. P.O.J. 2174, 2727, and 2878 show no susceptibility to mosaic, scarcely a sign of which has been observed in the last-named during six years' cultivation at Campos. P.O.J. 2725 is fairly susceptible, but does well at elevations of over 300 m. above sea level. Kassoer seems to be the only variety absolutely immune from mosaic.

Hiratsuka (N.). **Notes on Japanese rust fungi (VI).**—*J. Jap. Bot.*, xi, 5, pp. 330–334, 1 fig., 1935. [Japanese.]

This annotated list of twelve Japanese rusts [cf. *R.A.M.*, xiv, p. 533] contains a Latin diagnosis of *Puccinia rhei-undulati* (Diet.) Hiratsuka nov. comb., the teleuto stage of *Uredo rhei-undulati*, found on cultivated rhubarb (*Rheum rhaponticum*) and *R. undulatum*. It is characterized by small, round, scattered, blackish-brown teleutosori and ellipsoid or oblong, chestnut-brown, smooth teleutospores, 30 to 40 by 15 to 20 $\mu$, with a rounded, much thickened apex (7 to 10 $\mu$), a tapering or subrotund base, slightly constricted at the septum, and having a hyaline pedicel up to 45 $\mu$ long. *Paliurus ramosissimus* is infected by *Phakopsora zizyphi-vulgaris* [ibid., xii, p. 396].

Watanabe (T.). **New host plants of Corticium centrifugum in Nippon.** —Reprinted from *J. agric. Res. Soc. Utsunomiya agric. Coll., 1935*, 10, 4 pp., 4 figs., 1935.

A list is given of 24 recently detected hosts (mostly ornamentals such as *Iris*, *Yucca*, *Phlox*, and *Pentstemon*, or weeds, but also including *Lagenaria vulgaris* var. *depressa* and rhubarb) of *Corticium centrifugum* (*Sclerotium rolfsii*) in Japan [*R.A.M.*, xiii, p. 6; xiv, p. 399 and above, p. 701].

Wernham (C. C.). **A species of Sorodiscus on Heteranthera.**—*Mycologia*, xxvii, 3, pp. 262–273, 2 pl., 1 fig., 1 map, 1935.

The author describes a new species of the genus *Sorodiscus* [cf. *R.A.M.*, xiii, p. 60], which he names *S. heterantherae* [with an English diagnosis], found causing prominent, dark olive-brown to black galls, 0·5 to 3 cm. in diameter, with finger-like projections 0·5 to 1·5 cm. in

length, on the true and adventitious roots of *Heteranthera dubia* in lakes and streams of the St. Lawrence basin. The organism is believed to be possibly identical with the fungus described under the name *Membranosorus heterantherae* by Ostenfeld and Petersen (*Z. Bot.*, xxiii, pp. 13–18, 1930).

Marchionatto (J. B.). **Argentine Republic: species of Fusarium existing in the country.**—*Int. Bull. Pl. Prot.*, ix, 6, p. 125, 1935.

A study by C. Carrera of the species of *Fusarium* occurring in Argentina has revealed the presence of the following: *F. equiseti* and *F. culmorum* on peas [*R.A.M.*, xiii, p. 613]; *F. scirpi* var. *caudatum* [ibid., xiii, pp. 493, 593] on pepper [*Capsicum annuum*]; *F. heterosporum* [ibid., xiii, p. 385] and its var. *lolii* on *Spartina*; *F. culmorum* var. *cereale* on barley; *F. graminearum* [*Gibberella saubinetii*] on wheat [ibid., xii, p. 683]; *F. moniliforme* [*G. moniliformis*] on maize [ibid., xi, p. 505]; *F. poae* [ibid., xiv, p. 512] on wheat; and *F. lini* on flax [ibid., xi, p. 300].

Tunstall (A. C.). **A new species of Glomerella on Camellia thea.**—*Trans. Brit. mycol. Soc.*, xix, 4, pp. 331–336, 1 pl., 1 fig., 1935.

A brief account [including Latin and English diagnoses] is given of an apparently hitherto undescribed fungus which has been frequently isolated throughout the tea-growing areas of north-east India from externally sound wood in the vicinity of rotting lesions, and from dead wood, on tea branches, and which is named *Glomerella major* n.sp. The fungus occurs on tea both in the conidial (*Colletotrichum*) and ascigerous stages, the former being most frequent on material collected during the rainy season, when the perfect stage is markedly rarer. Apart from other minor differences, the fungus differs from *G. cingulata* [*R.A.M.*, xiii, p. 540] chiefly in the dimensions of its fructifications. The conidia are mostly cylindrical with rounded ends, occasionally slightly curved, 1- to 3-septate at germination, and measure 14·4 to 30·6 by 3·8 to 9·6 $\mu$ (mean 24·8 by 7·7 $\mu$). The conidiophores are simple or branched, brown-walled, clavate, 2- to 3-septate, about twice the length of the spores. The setae are brown to opaque brown, subacute, up to 4-septate, and 100 to 200 by 4·5 to 5 $\mu$. The perithecia develop in a stroma beneath the periderm, and either remain immersed or become erumpent; they are very variable in shape and measure from 130 to 150 $\mu$ in diameter; beaked ostioles are commonly present with or without an apical tuft of brown hairs; the beaks, when present, are cylindrical or subconical, and measure up to 160 by 100 $\mu$. The asci are clearly defined only when immature, and measure, when mature, about 70 to 110 by 10 to 18 $\mu$. Paraphyses are not present. The ascospores (usually eight to the ascus) are elliptical with obtuse or subacute tips, frequently slightly inequilatera[1], usually becoming brown when released into the perithecial cavity, and measure 15·6 to 30·1 by 5·5 to 8·4 $\mu$ (mean 24·9 by 7 $\mu$). The ascospores sometimes germinate *in situ*, becoming 1- to 2-septate, rarely 3-septate.

The fact that, apart from its almost invariable association with die-back of tea branches, the fungus was also frequently found in apparently

healthy branches strongly suggests that vigorous tea plants show considerable resistance to injury from its attacks. The same also appears to apply to *G. cingulata*, which in north-east India causes noticeable injury only to tea plants weakened by other causes.

STANLEY (W. M.). **Isolation of a crystalline protein possessing the properties of Tobacco-mosaic virus.**—*Science*, N.S., lxxxi, 2113, pp. 644–645, 1935.

A crystalline material, containing 20 per cent. nitrogen and 1 per cent. ash and having the properties of the tobacco mosaic virus, is stated to have been isolated at the Rockefeller Institute for Medical Research from the juice of Turkish tobacco plants infected by this virus. The procedure was as follows. Ammonium sulphate was added to the juice until a concentration of 0·4 saturation was obtained. The globulin precipitate was filtered off and repeatedly fractionated with ammonium sulphate; most of the remaining colour was removed by precipitation with lead acetate at $P_H$ 8·7. An inactive protein fraction was removed from the light yellow filtrate by adjusting to $P_H$ 4·5 and adding 2 per cent. of celite. The celite was removed, suspended in water, and the suspension filtered. The active protein was found in the filtrate. This treatment was repeated twice to remove completely the inactive protein and crystallization accomplished by the addition of 1 c.c. glacial acetic acid in 20 c.c. of 0·5 saturated ammonium sulphate to a faintly turbid ammonium sulphate solution of the protein.

Judged by the number of lesions produced on the leaves of Early Golden Cluster beans [*Phaseolus vulgaris*], *Nicotiana glutinosa*, or *N. langsdorffii* [*R.A.M.*, xiv, p. 601], the crystals are over 100 times more active than the suspension made by grinding up diseased tobacco leaves, and about 1,000 times more potent than the twice-frozen juice from infected plants. Typical mosaic infection is usually produced by 1 c.c. of a 1 to 1,000,000,000 dilution of the crystals. The injection of solutions of the crystals into animals causes the production of a precipitin active for the same solutions and for the juice of virus-infected, but not of normal, plants. The protein readily passes a Berkefeld 'W' filter, but collodion filters which fail to allow it to pass also prevent the passage of the virus.

The material herein described is considered to differ in every respect from the substances isolated by Vinson and Petre [ibid., xiv, p. 609] and by Barton-Wright and McBain, which Caldwell has shown [ibid., xiii, p. 475] to consist largely of organic matter totally unconnected with the activity of the products.

There is considered to be strong evidence that the crystalline protein is either pure or a solid solution of proteins. The tobacco mosaic virus is regarded as an autocatalytic protein presumably requiring the presence of living cells for multiplication.

THORNBERRY (H. H.). **Quantitative studies on the filtration of Tobacco-mosaic virus.**—*Phytopathology*, xxv, 6, pp. 601–617, 1935.

When various dilutions of the tobacco mosaic virus [see preceding and next abstracts] in distilled water were passed through Berkefeld

'W' filters the infectivity of the filtrate as compared with the similarly diluted unfiltered juice, judged by the average number of local lesions on bean [*Phaseolus vulgaris*] leaves, was greatest at the maximum dilution tested of $1 \times 10^{-3}$ (15 per cent. more infections than the unfiltered sample), owing evidently to the fact that a greater percentage of the virus filters through at high than at low dilutions. The filterability of the virus through Berkefeld 'W' candles was found to be influenced by the reaction of the medium (0·1 mol. disodium phosphate). At $P_H$ 8·5 it is completely filterable, at 1·5 non-filterable, and at intermediate values capable of partial filtration. Evidence was obtained that the retention of the infective principle at the extreme acid reaction is due to the clogging of the filter pores. Virus adsorbed to the filters from an acid suspension may be readily eluted in 0·1 mol. disodium phosphate buffer at $P_H$ 8·5, some 80 per cent. being released in 10 c.c. The filtration of the virus at $P_H$ 8·5 through Berkefeld 'W' candles increased its infectivity by 66 per cent. *Bacillus prodigiosus*, the diameter of which is given by Bergey (Manual of Determinative Bacteriology, 4th ed., 1934) as 500 to 1,000 $\mu\mu$, was found to pass filters with a pore size of 12 $\mu$, but not through Berkefeld 'V' filters with a pore size of 10 $\mu$. Using Bechhold's acetic collodion membranes [*R.A.M.*, xiii, p. 588], the tobacco mosaic virus at $P_H$ 8·5 just passed through those of 0·270 to 0·311 $\mu$ maximum pore size, but was retained by those with pore diameters of 0·187 to 0·218 $\mu$, on which basis its dimensions may be assumed to be 8 to 15 times smaller than the size of the pores allowing filtration (as Bechhold found for bacteria), or of the order of 18 to 38 $\mu\mu$.

THORNBERRY (H. H.). **Effect of phosphate buffers on infectivity of Tobacco-mosaic virus.**—*Phytopathology*, xxv, 6, pp. 618–627, 1 graph, 1935.

The infectivity of Johnson's No. 1 tobacco mosaic virus at a dilution of $1 \times 10^{-2}$, as judged by the average number of local lesions on Scotia bean [*Phaseolus vulgaris*] leaves [see preceding abstracts], was increased by 229, 353, and 411 per cent., respectively, by 0·1 mol. ammonium, sodium, and potassium dibasic phosphate at $P_H$ 7·2, 8·5, and 8·5, respectively. Trisodium phosphate at $P_H$ 11·2 inactivated the virus, the infectivity of which was further greatly reduced by sodium carbonate at $P_H$ 5. At all concentrations tested aluminium chloride and sulphate strongly diminished or inhibited infectivity (91 and 99 per cent., respectively, at 0·1 mol.). None of the other salts [which are listed] used in the experiments had any appreciable action on the infectivity of the virus up to 0·1 mol., above which concentration, however, all that were soluble to that extent reduced its virulence. No evidence was obtained that infectivity was influenced by the valency of the anion or cation. The optimum hydrogen-ion range for the infection of beans by a $1 \times 10^{-2}$ dilution of the virus was found to extend from $P_H$ 7 to 8·5. The virus was not inactivated by one hour's exposure between $P_H$ 1·5 and 9, reactions above which, however, reduced infectivity while those from $P_H$ 10·6 to 11·2 annulled it completely, the former in four hours and the latter in one minute. In 0·5 mol. mercuric chloride inactivation was complete in one hour.

Johnson (E. M.). **An example of spread of veinbanding from Potatoes to Tobacco.**—*Phytopathology*, xxv, 6, pp. 650-652, 1 diag., 1935.

In 1934 at the Kentucky Agricultural Experiment Station five plots of White Burley tobacco were set the last week in May near two plots of Irish Cobbler potatoes, one planted in the spring and the other in the middle of July. In No. 1 tobacco plot, veinbanding developed in the 90 rows opposite the potatoes to the extent of 53, 36, and 21 per cent., respectively, in the third part of the rows nearest the potatoes, the middle third, and the most distant third [see above, p. 685]. In the remaining 106 rows, not directly opposite the potatoes, the veinbanding percentages for the corresponding thirds were 18, 13, and 10, respectively, while in plot No. 5 they were 35, 18, and 14. Observations were also made on four other tobacco plots at the Station farm, in one of which, containing 414 plants, 60 ft. from potatoes, 66 per cent. of the stand was attacked by veinbanding, while another, 200 ft. from the same potatoes, showed 19 per cent. infection. In two other isolated plots the veinbanding percentages were 7 and 3, respectively, the latter being in that more distant from potatoes.

Dixon (L. F.), McLean (Ruth A.), & Wolf (F. A.). **The initiation of downy mildew of Tobacco in North Carolina in 1934.**—*Phytopathology*, xxv, 6, pp. 628–639, 1 fig., 2 maps, 1935.

Details are given of a study made in North Carolina in 1934 to ascertain the sources of inoculum for primary infections by downy mildew of tobacco [*Peronospora tabacina*: *R.A.M.*, xiv, p. 657].

The fungus overwinters in the State, presumably in the oospore stage, there being no evidence of its survival on plants escaping destruction by cold, or on the seed. Infections were found to develop earlier in seed-beds on sites similarly occupied the previous year than in those on new ground. They occurred, moreover, before the sporangia of the fungus could be trapped in the air in a given locality. The northward progression of the disease may be attributed to seasonal influences modifying the time of occurrence of primary infections in various districts. Primary infections by *P. tabacina* were observed in 35 per cent. of the seed-beds on old tobacco sites, where the fungus was also sporulating 7 to 19 days prior to the appearance of downy mildew in any of the neighbouring beds on new ground. Seed-beds on old sites may therefore be regarded as constituting primary centres of infection, secondary sources being the sporangia conveyed by the air or by human agency. None of the cultural methods practised in North Carolina can be relied upon to destroy all the soil inoculum in seed-beds on old sites, the use of which should therefore be strictly avoided.

Hill (A. V.). **Downy mildew of Tobacco on Tomato, Egg-plant, and Pepper.**—*J. Aust. Inst. agric. Sci.*, i, 2, p. 81, 1935.

When pepper [*Capsicum annuum*] seedlings grown in sterilized soil and protected with cellophane [*R.A.M.*, xiii, p. 694] were inoculated in Queensland with tobacco downy mildew (*Peronospora*) [*tabacina*] they readily became infected and in many cases succumbed [ibid., xiii, p. 191]. Negative results were obtained with tomato and eggplant seedlings and with all these hosts under field conditions. But the

author thinks that tomato and eggplant may be attacked under suitable conditions and regards difference in host range as insufficient ground to justify the specific separation of the American and Australian tobacco downy mildew fungi [ibid., xiv, p. 657].

ANDERSON (P. J.). **Leaf spots [of Tobacco in Connecticut].**—*Bull. Conn. agric. Exp. Sta.* 367, pp. 117–135, 9 figs., 1935. [Abs. in *Exp. Sta. Rec.*, lxxiii, 2, pp. 196–197, 1935.]

An account is given of the symptoms and occurrence of tobacco leaf spots in Connecticut, including those associated with wildfire (*Bacterium tabacum*), angular leaf spot or blackfire (*Bact. angulatum*), ring spot, mosaic (known locally as 'rust' or 'fleck'), and also the apparently physiological disorders known as John Williams broad-leaf spot, and the brown leaf spot and white speck, with both of which *Alternaria tenuis* (*Pleospora alternariae*) [*R.A.M.*, xi, p. 77] appeared to be associated as a saprophyte.

MICHAILOVA (Mme P. V.). **Pathologico-anatomical changes in the Tomato incident to development of woodiness of the fruit.**—*Phytopathology*, xxv, 6, pp. 539–558, 7 figs., 1935.

Full particulars are given of the writer's pathological-anatomical studies on all parts of tomato plants affected by the disorder known as 'woodiness' or 'stowboor' ['stolbur'] in the Crimea [*R.A.M.*, xiv, p. 130], and on the flowers and peduncles of *Convolvulus arvensis* suffering from a similar disturbance.

The following features, amongst others already described [cf. ibid., xiv, p. 128], were observed to be characteristic of the disease in tomatoes: precocious development of the stalks as compared with those of healthy plants, and of the interfascicular wood and ring of bast; hypertrophy of the tissues of the aerial organs, especially in the inner phloem; abnormally early disappearance of starch from the fruits; virtual absence of intercellular passages in the leaf and petal mesophyll; excessive development of the peduncle and pedicel; pollen sterility; and intensification of lignification in the fibrovascular bundles of the poorly-coloured, insipid fruits. Analogous changes were observed in *C. arvensis*.

SMITH (K. M.). **A new virus disease of Tomatoes.**—*Nature, Lond.*, cxxxv, 3422, p. 908, 2 figs., 1935.

Tomato leaves inoculated with a virus recently isolated at the Potato Virus Research Station, Cambridge, from diseased material of the same host received from L. Ogilvie, developed in five days a marked chlorosis with concentric yellow, purple, or necrotic spots. The youngest leaves next showed a tendency to twist and turn pale yellow. A gross lesion then appeared on the stem, at and just below soil level, mostly in younger plants, which subsequently wilted and collapsed.

The virus under observation has been differentiated from all the known viruses affecting tomatoes in the British Isles by ultra-filtration and immunity studies, by its physical properties, and especially by its manifestations on differential hosts. The unusual reaction produced on

cowpea is stated to be alone sufficient to distinguish the new virus from others of the tomato streak group [*R.A.M.*, xiv, p. 261].

Ogilvie (L.). **Spotted wilt of Tomatoes and its control.**—*Rep. agric. hort. Res. Sta. Bristol, 1934*, pp. 170–174, 2 pl., [1935].

Investigations at Long Ashton into the host range of the tomato spotted wilt virus [*R.A.M.*, xiv, pp. 201, 662] showed that the disease is uncommon in glasshouses entirely given over to tomatoes. On several occasions severe outbreaks occurred in houses where arum lilies (*Richardia africana*) [*Zantedeschia aethiopica*] showed a marked spotting of the leaves, stems, and flowers that was ascertained to be due to spotted wilt, this being the first record of the disease on a monocotyledonous host [ibid., xiv, p. 367], and of particular importance as arum lily is a favourite breeding place of the insect vector of the disease, *Thrips tabaci*. Experience has shown that in houses where only tomatoes or tomatoes and arum lilies are grown control is possible by means of frequent roguing and insect extermination.

A list is given of the host plants, belonging to 14 families and over 40 species, on which spotted wilt has been recorded in England [ibid., xiii, pp. 133, 333].

Hüttig (W.). **Die Sexualität bei Glomerella lycopersici Krüger und ihre Vererbung.** [Sexuality in *Glomerella lycopersici* Krüger and its inheritance.]—*Biol. Zbl.*, lv, 1–2, pp. 75–83, 5 figs., 1935.

Details are given of the writer's hybridization studies on *Glomerella lycopersici* Krüger [*R.A.M.*, xi, p. 478], the agent of a tomato disease in Germany, the inheritance of sexual reactions in which was found to be governed by three factors, all located in the same chromosome.

Hiksch (F.). **Beitrag zur forstlichen Schädenfrage der arsenigen Säure im weissen Hüttenrauch der Arsenikhüttenwerke.** [A contribution to the problem of silvicultural damage from the arsenious acid in the white smelter smoke of the arsenic foundry plant.]—*Tharandt. forstl. Jb.*, lxxxv, 3, pp. 117–166, 3 figs., 1934. [Abs. in *Biol. Abstr.*, ix, 5, p. 1001, 1935.]

A summary is given of the results of a century of research on arsenic damage in German forests, with a description of the effects produced by the fumes from the large arsenic plant near Reichenstein, Silesia [cf. *R.A.M.*, xii, p. 524]. The injury extends for 2 to 3 km. in the direction of the prevailing wind and is more severe on the outer fringes than inside the stands. Among hardwoods ash is the most susceptible, followed in the order named by beech, birch, oak, and poplar, the corresponding sequence for conifers being spruce, fir, Scotch pine [*Pinus sylvestris*], white pine [*P. strobus*], Douglas fir [*Pseudotsuga taxifolia*], and larch. The toxic effect of the fumes assumes the form of a browning or burning of the foliage.

Lamb (H.), Wright (E.), & Davidson (R. W.). **A root rot of Chinese Elms.**—*Phytopathology*, xxv, 6, pp. 652–654, 1 fig., 1935.

Nursery stock of Chinese elms (*Ulmus pumila* L. and *U. parvifolia* Jacq.) in the Great Plains region of the United States has been found to

suffer from a serious root rot caused by *Chalaropsis thielavioides* [*R.A.M.*, xiv, p. 408]. Infection probably originates in the seed-bed and may spread rapidly in storage or during transit. The first visible symptom is a greyish-white, mould-like growth over injuries or cracks on the roots, the outer tissues of which turn dark brown to black and break down into a slimy mass as the rot progresses.

The typical micro- and macroconidia of the fungus develop in profusion both in nature and in culture, the former being hyaline to light brown, cylindrical, and borne on long, hyaline or light brown conidiophores, while the latter are dark, broadly ovoid to spherical, and borne on short, hyaline conidiophores. Both types of conidia are very similar to those of *Ceratostomella fimbriata*, but no perfect stage has yet been found for the elm fungus.

Inoculation experiments with *Chalaropsis thielavioides* on *U. pumila* gave positive results. The fungus appears to overwinter in the soil, so that the disease may probably be combated by the establishment of new seed-beds or the sterilization of old ones with steam or formaldehyde, supplemented by a chemical dip treatment of the cuttings.

Sibilia (C.). **Saggi sulla resistenza di alcuni Olmi asiatici a 'Ceratostomella ulmi' Buis.** [Experiments on the resistance of certain Asiatic Elms to *Ceratostomella ulmi* Buis.]—*Boll. Staz. Pat. veg. Roma*, N.S., xv, 1, pp. 116–121, 1935.

After stating that *Ulmus pumila* and *U. pumila pinnato-ramosa* have so far shown no sign of infection by *Ceratostomella ulmi* (renamed by Melin and Nannfeldt *Ophiostoma ulmi*) [*R.A.M.*, xiv, p. 274] in Italy, where they have recently been widely planted [ibid., xiii, p. 481; xiv, p. 665], the author describes a series of inoculation experiments with the fungus on the following grafted Asiatic species and varieties of elm, viz., *U. japonica*, *U. elliptica*, *U. laciniata* var. *nikkoensis*, and *U. 'karagatch'* (possibly *U. pumila arborea*); external symptoms of infection appeared on all except *U. elliptica* one month after inoculation, this result confirming those obtained with the same hosts in Holland [ibid., xiii, p. 664]. Histological examination of the inoculated branches (from all of which the organism was reisolated) showed an average advance of 19 cm. in *U. laciniata* var. *nikkoense*, 14 cm. in *U. karagatch*, and 11 cm. in *U. japonica*. It is evident that the virulence of the Italian strains of *C. ulmi* approximates closely to that of the Dutch strains.

Gravatt (G. F.), Mahoney (A. E.), & Stout (G. L.). **Chestnut blight in California.**—*Mon. Bull. Calif. Dep. Agric.*, xxiv, 4–5–6, pp. 173–191, 9 figs., 1935.

In the first part of this paper Gravatt states that chestnut blight (*Endothia parasitica*) [*R.A.M.*, xiv, p. 611] was recorded for the first time in Oregon in 1929 [ibid., ix, p. 352] on two trees which were cut and burnt; the disease did not apparently spread further, but in September, 1934, the fungus was found to be still active on the stump of one of the two infected trees, about a foot below the ground, and measures were taken to eradicate and destroy this stump. Mention is also made of the finding previously to 1932 of an infection with blight of a European chestnut at Agassiz, British Columbia, followed by the

cutting down of a number of unhealthy trees; in 1934, however, an infected tree (since destroyed) was again found in the locality by the author. In October of the same year, he discovered a single infected tree in an orchard near Stockton, California, following which an official survey was undertaken of the chestnut trees in the San Joaquin County, which resulted in the finding of 43 blight-infected trees in another orchard. Field observations suggest that the disease had been present in this orchard for a minimum of eight years. In a brief, popular account of the disease, it is stated that the blight appeared to be more virulent on the European chestnut at Stockton than in the eastern United States, as the cankers did not seem to be checked in their development by the formation of callus tissue at the margins. A disturbing feature of the outbreak was the fact that two Japanese walnut [*Castanea crenata*: ibid., xiv, p. 611] trees were found to have been killed by the fungus, though a third tree was showing resistance.

In the second part Mahoney describes the procedure used by him in the eradication of the disease in the infected areas, and in the third part Stout gives details of the survey which was made in October, 1934, throughout California, and failed to discover any further cases.

Goidànich (G.). **Coloration du bois de Pin produite par une variété de Sphaeropsis ellisii Sacc.** [Discoloration of Pine wood produced by a variety of *Sphaeropsis ellisii* Sacc.]—*Boll. Sez. ital. Soc. int. Microbiol.*, vii, 5, pp. 181–184, 1935.

A strong dark green to black discoloration of old trunks of *Pinus pinea* stacked in a timber-yard in Rome, and of standing trees of the same species in a neighbouring grove, was caused by a variety of *Sphaeropsis ellisii* Sacc. which the author names *S. ellisii* var. *chromogena* G. Goid. var. n. In many instances infection of the living trees, which was very extensive (the fungus evidently doing much greater damage than any of the other staining organisms isolated, some of which are considered highly dangerous outside Italy), had been favoured by removal of part of the roots during the box planting which is practised in the plantations examined by the author. Entry occurred at the site of galleries made by the bark beetle *Myelophilus piniperda*. The mycelium was found almost exclusively in the medullary rays. In the author's opinion, his observations support the view that staining fungi are capable of killing living trees.

Fructification was observed in nature, but in culture was obtained only with difficulty, though it occurred abundantly during inoculation tests (which rapidly gave positive results) on paraffined blocks.

Hubert (E. E.). **Some agencies attacking blister rust on White Pine.**—*J. For.*, xxxiii, 6, pp. 603–606, 1 fig., 1935.

Notes are given on the parasitization of the white pine [*Pinus strobus*] blister rust [*Cronartium ribicola*] in the United States by certain biological agents, including the purple mould (*Tuberculina maxima*) [*R.A.M.*, xiv, p. 482] and various insects and rodents. Owing to the slow progress and erratic incidence of these natural factors they are scarcely likely to supersede the control methods of proved utility over

the vast areas to be covered, but it is thought that further studies should be made on their individual and combined possibilities.

HUBERT (E. E.). **A disease of conifers caused by Stereum sanguinolentum.**—*J. For.*, xxxiii, 5, pp. 485–489, 1 fig., 1935.

In the spring of 1930 about 90 of the 18- to 20-year-old Douglas fir (*Pseudotsuga taxifolia*) trees in a dense pure stand near Moscow, Idaho, showed evident signs of disturbance rapidly followed by death. Later a number of true firs (*Abies grandis*), spruce (*Picea excelsa*), white pines (*Pinus strobus* and *P. monticola* [western]), and 50 larch (*Larix europaea*) all growing in pure stands, were found to be similarly affected. *Stereum sanguinolentum* [*R.A.M.*, xiv, p. 663] was isolated from the diseased material and grown in pure culture on malt agar.

The symptoms produced by the fungus are fully described. The external features of the so-called 'mottled bark' disease are few and inconspicuous, being most noticeable on Douglas firs in the shape of whitish streaks near the base of the trunk. Resin exudation from the lower part of the trunk and root collar is a common symptom in Douglas firs, spruces, true firs, and to a lesser extent in the white pines. The flat, leathery sporophores are greyish, hairy, and zonate on the dorsal surface and smooth and tan to brownish- or purplish-black on the hymenial one. The bark covering the infected roots, crown, and base of the trunk parts readily from the sapwood, showing a white mottling of its inner surface. The spots vary in shape and size from small, lens-shaped areas suggestive of a pocket rot to larger, confluent patches and streaks; in the later stages the incipient pockets actually develop into hollows, a feature stated to be common to all rots induced by *S.* spp. The underlying sapwood shows a pale to dark greyish-brown discoloration and becomes abnormally soft and spongy. In the descriptions from Canada given by Faull and Miss Mounce [ibid., iii, p. 749] and by McCallum [ibid., v, p. 527], the discoloration is stated to occur in the centre of the heartwood whence it spreads outward towards the sapwood, whereas in the Idaho material the position is exactly reversed. In the former case the symptoms point to the entry of a heart-rotting saprophyte through dead branches or other injuries, whereas in the latter the fungus obviously occurs in a parasitic or semi-parasitic form, attacking the living tissues of a weakened or badly damaged tree and spreading from the bark to the sapwood and ultimately to the heartwood.

A brief discussion is given on the damage caused by *S. sanguinolentum* (involving a 50 per cent. loss within three years in the Douglas firs), and on the measures, based on general silvicultural principles in the absence of more exact knowledge, likely to aid in its control.

ROTH (C.). **Untersuchungen über den Wurzelbrand der Fichte.** [Studies on the root scorch of the Spruce.]—*Schweiz. Z. Forstw.*, lxxxvi, 6, pp. 196–208, 1935.

This is an abbreviated account of the writer's work on root scorch (damping-off) of spruce (*Picea excelsa*) in Switzerland, associated with *Fusarium* spp. [including *F. bulbigenum* var. *blasticola* and *Gibberella moniliformis* (*F. moniliforme*)], *Pythium de Baryanum*, and *Corticium*

*vagum*, the full report of which has already been noticed from another source [*R.A.M.*, xiv, p. 482].

Steiner (H.). **Eine neue Krankheit der Douglasien in Oesterreich.** [A new disease of Douglas Firs in Austria.]—*Wien. allg. Forst- u. Jagdztg*, lii, 25, pp. 113–114, 1935.

*Adelopus* (?) *balsamicola*, previously recorded from Switzerland and Germany [*R.A.M.*, x, p. 634], has been found attacking 20-year-old green Douglas firs [*Pseudotsuga taxifolia* var. *viridis*] in one locality in Austria. A brief note is given on the symptoms of the disease, which involves almost complete loss of needles, and on the very imperfectly known life-history of the causal organism.

Davidson (R. W.). **Fungi causing stain in logs and lumber in the southern States, including five new species.**—*J. agric. Res.*, l, 10, pp. 789–807, 4 figs., 1935.

The author [who does not cite Melin's and Nannfeldt's paper on the subject: *R.A.M.*, xiv, p. 274] gives details of his investigations in 1931 and 1932, the results of which showed that most of the forest and sawmill-yard blue staining of felled timber in the southern United States is caused by species of the Ceratostomataceae, among which *Ceratostomella ips* and *C. pilifera sensu* Hedgcock were the most frequently isolated from pine, and *Endoconidiophora coerulescens*, *E. moniliformis*, and *C. pluriannulata* from hardwoods. Latin and English diagnoses are given of two species of *Ceratostomella* considered to be new to science, namely, *C. multiannulata* (common on pine timber but apparently causing little interior discoloration), and *C. obscura* which was obtained only twice from stained pine logs. The genus *Endoconidiophora* is retained for those species of *Ceratostomella* which have endoconidia, and *C. adiposum* and *C. paradoxa* are transferred to it under the new binomials *E. adiposa* and *E. paradoxa*. Isolations from stained timber also yielded a number of Fungi Imperfecti, among which *Diplodia natalensis* [cf. ibid., xiii, p. 763] and *Graphium rigidum* [ibid., xiii, p. 555] alone appeared to be of importance. Three of the species isolated are described as new [with Latin and English diagnoses], namely, *Cadophora brunnescens*, *C. repens*, and *Leptographium microsporum*; they are not apparently of much importance as wood-stainers.

Levón (M.). **Prevention of timber discoloration. Results of chemical dipping methods.**—*Finsk PappTidskr., 1935*, pp. 256–262, 1935. (Special issue in English.) [Abs. in *Chem. Abstr.*, xxix, 13, p. 4542, 1935.]

In order to prevent the development of the fungi responsible for blueing of timber in Finland [*R.A.M.*, xii, p. 257; xiv, p. 545], the moisture content of the wood should not exceed 24 per cent. and it should be kept at a temperature just above 0° C. Most of the discoloration develops during the drying process and experiments were conducted to determine the value of certain dipping methods in control. The best results were obtained with lignasan (ethyl mercury chloride) [ibid., xiii, p. 556; xiv, p. 612] and 0·4 to 0·8 per cent. 'dowicide' (chlorinated phenols) in aqueous solutions.

Witkowski (N.). **Über die höheren Pilze der Umgegend von Tartu.** [On the higher fungi of the Tartu district.]—*Arch. Naturk. Eestis*, II Ser., xv, 3–4, pp. 113–180, 1 map, 1934.

An annotated list is given of some 520 higher fungi occurring in the neighbourhood of Dorpat, Esthonia, including a number of well-known wood-destroying organisms.

Varadhan (C.) & Rao (K. A. N.). **Preservation of wood. Part I. Treatment with creosote-water emulsion.**—*J. Indian Inst. Sci.*, xviii A, 8, pp. 49–59, 1935.

A stable 50 per cent. emulsion of coal-tar creosote in water suitable for wood impregnation has been prepared at Bangalore, using as a stabilizer 0·5 to 1 per cent. nekal A.E.M. (a mixture of 80 per cent. finely powdered glue and 20 per cent. nekal BX, a sulphonated naphthalene derivative, supplied by I.G. Farbenindustrie A.G.). Laboratory and semi-commercial impregnation experiments [the data from which are tabulated and discussed] conducted with this emulsion on a number of well-known Indian timbers, including *Dipterocarpus indicus*, *Terminalia paniculata*, *T. tomentosa*, *Dillenia pentagyna*, *Lagerstroemia lanceolata*, and *Mimusops elengi* showed that the mixture is absorbed in large quantities. Treated samples have further resisted insect and fungus attacks during two years' exposure.

Ogilvie (L.), Mulligan (B. O.), & Brian (P. W.). **Progress report on vegetable diseases. VI.**—*Rep. agric. hort. Res. Sta. Bristol, 1934*, pp. 175–190, 2 pl., [1935].

This report, which is on the same lines as those for previous years [*R.A.M.*, xiii, p. 667], contains *inter alia* the following items of phytopathological interest. The form of *Rhizoctonia crocorum* [*Helicobasidium purpureum*: loc. cit.] found on asparagus in the Evesham district can attack carrots, garden beets, sugar beets, mangolds, parsnips, and potatoes. In further pot experiments with nine species of *Fusarium* isolated from dwarf beans (*Phaseolus vulgaris*) affected with foot rot [ibid., xiii, p. 668] several of the fungi were found to be pathogenic, but none was so severely or consistently virulent as *F. solani* var. *martii*. The flageolet St. Andrew dwarf bean variety showed satisfactory resistance. Celery soft rot was widespread and destructive; it appears to be probable that in all the cases observed the bacteria associated with the condition were *Bacillus carotovorus* [cf. ibid., vii, p. 218; x, p. 125]. The species of *Botrytis* causing dying-off of winter lettuces growing in the open [ibid., xiii, pp. 139, 669] are being critically investigated; the Lees Immense (various strains), Arctic King, Imperial, and Yate's Winter White varieties again showed satisfactory resistance, with over 70 per cent. survivals through the winter. Mosaic disease of lettuce [ibid., xiii, p. 668] was present to an alarming extent; of 700 plants from mosaic seed 37 per cent. became affected, the corresponding figure for similar commercial seed being 11 per cent. Preliminary experiments indicated that *Macrosiphum sonchi* may be implicated in the transmission of the disease. Pot and field inoculations with the *Fusarium* species isolated from pea foot rots [ibid., xiii, p. 669] showed

that all the most virulent isolations belonged to *F. solani* var. *martii* f. 2 (syn. *F. martii* var. *pisi*) [ibid., xiv, p. 613].

HOGGAN (ISMÉ A.) & JOHNSON (J.). **A virus of crucifers and other hosts.**—*Phytopathology*, xxv, 6, pp. 640–644, 2 figs., 1935.

Reference has been made at various times to crucifer mosaic in widely separated regions of the United States [*R.A.M.*, vi, p. 214; ix, p. 572; xii, p. 546] as well as in Europe [ibid., xiii, pp. 151, 211; xiv, p. 669, and next abstract]. In 1933 the writers' attention was called to a conspicuous mottling of turnip leaves in a cool greenhouse at 60° F. From two of the diseased plants a virus was isolated that proved to be infectious to a number of crucifers and other hosts; it was transmissible mechanically by means of the juice and more readily by the aphids *Myzus persicae* and *Brevicoryne brassicae*. At 70° to 80° cabbage showed a mild foliar mottling, and mustard and rape severe necrosis and yellowing, followed, in the event of survival of the plants, by distinct mosaic symptoms, sometimes accompanied by savoying of the laminae. Horse-radish leaves and root-cuttings received from Illinois were found to contain a similar virus. Plants grown from the infected root-cuttings showed well-defined vein-clearing and mottling of the leaves.

More striking symptoms were induced by inoculation with the crucifer virus on Connecticut Havana No. 38 tobacco plants, which developed prominent brown, necrotic local lesions, up to 5 mm. in diameter, at the sites of infection on the leaves. Similar local lesions developed also on the hybrid, *Nicotiana tabacum* × *N. glutinosa*, though the latter showed only mild chlorotic spots, with occasional faintly necrotic rings. Mild symptoms were further produced on the red currant tomato (*Lycopersicum pimpinellifolium*), while Bloomsdale spinach contracted systemic infection, manifested by well-defined mottling. The necrotic local lesions on tobacco are of special interest in view of their possible occurrence in the field, where plants growing near crucifers might readily contract this form of mosaic through the agency of aphids.

The thermal death point of the crucifer virus was found to be about 54° C. (ten minutes' exposure), and its tolerance to dilution 1 to 1,000 (1 to 10,000 in one test). Longevity *in vitro* at 20° to 22° usually lay between 24 and 48 hours and was always less than three days under experimental conditions. Non-treated extracts from horse-radish produced considerably more lesions on tobacco than similar material from cabbage. Inclusion bodies were not detected.

PAPE (H.). **Über eine Mosaikkrankheit der Kohlrübe.** [On a mosaic disease of the Swede.]—*Dtsch. landw. Pr.*, lxii, 26, pp. 319–320, 4 figs., 1935.

For some two years past observations have been made on a widespread mosaic disease of swedes [cf. preceding abstract] in Schleswig-Holstein, characterized by chlorosis, curling, and premature shedding of the leaves and a dark spotting of the petioles and thicker veins. The petioles are thinner and more numerous than those of normal plants, with a correspondingly larger number of leaf scars (9 to 10 compared with 5 per 7 cm. of collar). The incidence of infection was found to

range from 1 to 90 per cent., the diseased plants occurring singly or more commonly in groups in otherwise healthy stands, especially in the vicinity of quick-set hedges. Early drilling (end of April or beginning of May) appears to favour the mosaic, which attacks with particular severity the Seefelder, Yellow Wilhelmsburger, and Yellow and White Criewener varieties, while Pomeranian Kannen, Yellow Sarling, and White Schmalz are relatively resistant. The losses caused by the disease may be appreciable, the reductions of leaf and root yield amounting in three test plots to as much as 63 and 57 per cent., respectively. Experimental evidence was obtained of the transmission of the disease by *Lygus pratensis* and also by the inoculation of healthy swede leaves with the juice from mosaic foliage.

Anderson (M. E.) & Walker (J. C.). **Histological studies of Wisconsin Ballhead Cabbage in relation to resistance to yellows.**—*J. agric. Res.*, l, 10, pp. 823–836, 2 pl., 2 figs., 1935.

A full account is given of the authors' comparative histological studies of the penetration of the cabbage yellows organism (*Fusarium conglutinans*) into the tissues of a very susceptible strain of Hollander cabbage, of the intermediately resistant Wisconsin Hollander, and of the homozygous resistant Wisconsin Ballhead [*R.A.M.*, xiv, p. 485]. The results showed that all three types are readily entered through the root tip and through the cortex of the young root and hypocotyl, penetration of the cell walls being apparently accomplished by mechanical pressure. Penetration in Wisconsin Ballhead was generally limited to the outer cortical cells or the lower root tip region, and very seldom reached the vascular system, while in Wisconsin Hollander penetration was somewhat more extensive. Suberization of the cortical cells in advance of the fungus was noted only in Wisconsin Ballhead, but suberization of endodermis and pericycle walls often occurred locally in both resistant types when these tissues were approached by the fungus; these reactions, however, were not constant. The investigation is considered to indicate that the basis of resistance in Wisconsin Ballhead differs in degree rather than in kind from that in Wisconsin Hollander, and that it cannot be determined by histological methods.

Gibbs (J. G.). **Control of club-root in Cabbage seed-beds.**—*N.Z. J. Agric.*, l, 5, p. 294, 1935.

This paper on the control of club root [*Plasmodiophora brassicae*] in cabbage seed-beds in New Zealand is a shorter version of one already noticed from another source [*R.A.M.*, xiv, p. 278].

Brandenburg (E.). **Physiologische ziekten der Bieten. III. Potproeven en proefvelden ter bestudeering van het hartrot.** [Physiological diseases of Beets. III. Pot tests and trial fields for the study of heart rot.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 4, pp. 81–91, 2 figs., 1935. [French summary.]

In tests on beet plants in pots filled with quartz or with soil from diseased fields, the application of boric acid at the rate of 30 to 50 mg. per plant completely prevented heart rot [*R.A.M.*, xiv, p. 613 and next abstracts] and greatly increased the sugar content, similar results being

obtained both in Holland and Germany by the use of borax (costing 15 cents per kg.) at the rate of 20 to 25 kg. per hect. The beneficial effects of the treatment were observed to persist during the year after application. Heart rot was found to be prevalent on sandy soils throughout the southern provinces of Holland.

De Haan (K.). **Physiologische ziekten der Bieten. III. Verdere veldproeven voor het onderzoek naar de werking van borax op Suiker- en Voederbieten.** [Physiological diseases of Beets. III. Further field tests in the study of the effect of borax on Sugar and Fodder Beets.]—*Meded. Inst. Suikerbiet., Bergen-o.-Z.*, 4, pp. 92–102, 1935. [French summary.]

The percentages of plants showing heart rot [see preceding and next abstracts] symptoms in plots on a slightly acid, sandy soil at Langendijk, Holland, in 1934, declined from 66 where no treatment was given to 0·1 with borax at the rate of 40 kg. per hect. At 10 kg. per hect. borax increased the sugar yield and sugar content by 34 and 10 per cent., respectively, compared with the control, besides reducing the incidence of heart rot to 2 per cent. The leaf yield was increased 25 and 50 per cent. by 10 and 40 kg. borax, respectively, the corresponding figures for the roots being 22 and 28, respectively. Similar favourable results were obtained in tests on fodder beets, which responded to the application of 20 kg. borax by an increased sugar yield and content of 65 and 16 per cent., respectively, the corresponding figure for dry matter being 58 per cent. In relatively mild cases of heart rot nitrate of soda (1,000 kg. of which was calculated to contain 0·6 kg. borax) was found to exert preventive or curative effects and produce moderate increases of yield. Some indications were obtained at Haarlemmermeer that borax produces a stimulatory or nutritive action in the absence of disease.

Kraus (E.). **Herz- und Trockenfäule der Runkelrüben.** [Heart and dry rot of Beets.]—*Dtsch. landw. Pr.*, lxii, 24, p. 297, 3 figs., 1935.

Very satisfactory results, both as regards yield and freedom from heart and dry rot, are stated to have been obtained in the treatment of beets in a German experiment with powdered borax at the rate of 15 or 30 kg. per hect. [see preceding abstracts]. In one series the yield per plot of 104 sq. m. was increased from 244 to 470·8 and 528·3 kg., respectively, the corresponding figures in the other series per plot of 100 sq. m. being 435·5 kg. for the untreated plot and 458 and 463·5, respectively, for those receiving 15 and 30 kg. borax per hect. This very valuable treatment involves little or no additional labour and its low cost (M. 6 per hect.) is considered to be out of all proportion to the resultant profits.

Wilson (R. D.). **Bacterial blight of Beans. The detection of seed infection.**—*J. Aust. Inst. agric. Sci.*, i, 2, pp. 68–75, 1935.

Isolations made in New South Wales during the past three years from French beans (*Phaseolus vulgaris*) affected with bacterial blight have consistently yielded *Bacterium medicaginis* var. *phaseolicola* [*R.A.M.*, xiv, p. 565] to which most if not all the losses from bacterial blight in the State are attributed. The author describes experiments

which demonstrated that the soaking of affected seed in water before sowing was of value in testing for the presence of the disease; it resulted in an increase in the number of affected seedlings and accelerated the appearance of the symptoms. The detection of severely affected samples was also effected in a few days by soaking some of the seeds in water and inoculating bean pods with the infusion. The optimum period of soaking the seeds appeared to be under 24 hours.

MÜLLER (A. S.). **Doenças do Feijao em Minas Geraes.** [Kidney Bean diseases in Minas Geraes.]—*Bol. Agric. Zootech. Vet. Minas Geraes, 1934*, 7, pp. 384–388, 1934. [Abs. in *Hort. Abstr.*, v, 2, pp. 89–90, 1935.]

The six diseases commonly affecting kidney beans [*Phaseolus vulgaris*] in the State of Minas Geraes, Brazil, are anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, xiii, p. 741]; rust (*Uromyces appendiculatus*) [ibid., xiv, p. 669]; angular spot (*Isariopsis griseola*) [ibid., xiv, p. 87], severe only during protracted dry spells; mildew (*Oidium* sp.), occurring exclusively in abnormally damp seasons; a seed-transmissible mosaic [ibid., xiv, p. 485] which causes yellowing and atrophy on most varieties, though Manteigeo has shown no sign of infection during five years' observation; and *Rhizoctonia* [*Corticium*] *solani* [ibid., xii, pp. 133, 671]. Varieties resistant to the first two of these diseases are available.

NATTRASS (R. M.). **Note on Botrytis sp. as the cause of 'chocolate spot' of Vicia faba in Cyprus.**—*Cyprus (agric.) J.*, xxx, 2, pp. 57–58, 1 fig., 1935.

During the very wet spring of 1935 broad beans (*Vicia faba*) in Cyprus were widely attacked by chocolate spot, usually attributed to *Bacillus lathyri*, typical round, oval, or occasionally irregular, frequently confluent lesions, 0·5 to 4 mm. in diameter, developing on the leaves, stems, and petioles; lesions more than 1 mm. in diameter had a brown centre surrounded by a chestnut margin.

From affected material the author isolated a *Botrytis* [see next abstract] which in culture produced a sparse aerial mycelium, conidiophores, and sclerotia measuring 0·5 to 3 by 0·3 to 2 by 0·8 mm. The subglobose to oval, sometimes cuneiform, conidia were 13 to 20 by 9 to 18 $\mu$ in diameter and were borne in terminal or intercalary clusters on minute sterigmata at the slightly swollen apices of branched conidiophores.

Inoculations of *V. faba* plants with a conidial suspension of the fungus gave positive results both in the laboratory and the field, the leaves developing typical lesions and sometimes withering in 3 or 4 days. The fungus, which agrees fairly closely with *B. fabae* Sardiña [*R.A.M.*, xiii, p. 741], is a virulent parasite and is considered to be responsible for much of the disease on the island.

WILSON (A. R.). **Relation of Botrytis spp. to the 'chocolate spot' disease of Beans (Vicia faba).**—*Nature, Lond.*, cxxxvi, 3432, p. 226, 1935.

Work has been in progress at Cambridge since 1931 on different aspects of the destructive 'chocolate spot' disease of broad beans, the bulk of which has been found to be due in Britain to several forms of

*Botrytis* [see preceding abstract]. A full report on these investigations will be published at a later date.

In the field the disease may assume two forms: (1) a lethal attack ending in the blackening and death of a part or the whole of the shoot system, and (2) relatively mild infection expressed by 'chocolate spot' symptoms. Both types of the disease have been reproduced by artificial inoculations in field plots.

GOTO (K.). **Onion rusts of Japan. II. Biometrical studies on uredio- and teliospores.**—*J. Soc. trop. Agric. Taiwan*, vi, pp. 44–53, 1934; vii, pp. 38–47, 1935.

No significant differences were disclosed by the writer's extensive statistical studies [the data obtained in which are tabulated and discussed] between the uredospores of the strains of onion rust (*Puccinia*) [*allii* or *P. porri*: *R.A.M.*, xiii, p. 558] occurring in the north and south of Formosa, Japan, except for a reduction in size (especially length) of those of the southern strains cultured on *Allium cepa*. The northern teleutospores were found to be generally larger, and especially wider, and with a thinner apical epispore, than the southern ones. When cultured at Taihoku, in the southern area, the teleutospores of the northern strains underwent certain modifications, including an increase in width and apical epispore thickness and a reduction in length. The strain on *A. schoenoprasum* was found to differ from those on *A. fistulosum* and *A. bakeri* in its broader and shorter teleutospores with a fairly thick apical epispore, while that on *A. bakeri* was distinguishable from the *fistulosum* strains by its shorter teleutospores with a thinner apical epispore, such variations being generally greater than those existing between the northern and southern groups of *fistulosum* strains.

TEMPEL (W.). **Bekämpft die Fusskrankheit des Spargels.** [Combat the foot rot of Asparagus.]—*Ratschl. Haus, Garten, Feld*, x, 6, pp. 81–82, 1935.

Asparagus in Rhenish Hesse is stated to have been attacked at the end of July and beginning of August, 1934, by *Fusarium culmorum* [*R.A.M.*, x, pp. 288, 289], the incidence of infection by which ranged from 1 to 5 per cent. of the crop. The disease is very probably spread by manure containing infected straw as well as by urban refuse with its high proportion of vegetable waste. In addition to the immediate removal and burning of the diseased shoots down to the root collar, it may be advisable in severe cases to treat the soil for a radius of 1 to 2 m. round the site of infection with 0·25 per cent. uspulun.

**Statutory Rules and Orders, 1935, No. 578. Destructive Insect and Pest Acts, England. The Importation of Elm Trees and Conifers (Prohibition) (Amendment) Order of 1935. Dated June 18, 1935.**—1 p., 1935.

The Importation of Elm Trees and Conifers (Prohibition) Orders of 1933 [against *Ceratostomella ulmi*: *R.A.M.*, xiii, p. 63] and 1935 are hereby amended to permit the importation into England, as from 19th June, 1935, for instructional, scientific, and similar purposes under official authorization of plants of any of the genera mentioned in the Schedule to the first-named (principal) Order.

**Order in Council.—No. 1643. Made under (1) The Customs and Excise Regulation Laws, 1879 to (No. 3) 1930. (2) The Diseases of Plants Prevention Law, 1893. (3) The Customs, Excise, and Revenue Law, 1899.**—1 p., 1935.

As from 21st June, 1935, every person arriving in Cyprus by sea or air is required, immediately upon landing, to sign a declaration vouching for the absence from his person or personal luggage of living plant material of any kind other than that duly listed and submitted for inspection and examination [cf. *R.A.M.*, xiv, p. 325].

**Amtliche Pflanzenschutzbestimmungen.** [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 4, p. 37, 1935.

Saxony. As from 15th February, 1935, fruit trees severely attacked by canker [*Nectria galligena*: *R.A.M.*, xiii, p. 584] or other diseases or pests should be cut down where remedial measures are no longer indicated. Witches' brooms on cherry [*Taphrina cerasi*] should be excised [ibid., xiii, p. 544] and, if necessary, the trees are to be removed. The operations herein prescribed should be carried out before 15th March of each year. In the event of non-compliance with these regulations the police may order the work to be done at the defaulter's expense.

**Amtliche Pflanzenschutzbestimmungen.** [Official plant protection regulations.]—*Beil. NachrBl. dtsch. PflSchDienst*, vii, 6, pp. 91–93, 1935.

Prussia (Hanover). An Order of 14th February, 1935, defines the regulations governing co-operative cereal seed-grain disinfection [*R.A.M.*, xiii, p. 89]. Permission in the form of an annual licence costing M.30 for large plants operating by machinery and M.20 for those on a smaller scale with drum apparatus, the renewals M.20 and M.10, respectively, will be granted by the local authorities to properly qualified persons with suitable premises on the understanding that only officially approved plant protectives are used [ibid., xiv, p. 20] at the prescribed concentration. Police inspections of these 'co-operative disinfection premises under official supervision' will be made from time to time to ensure compliance with the rules, any infringement of which involves a fine not exceeding M.150.

East Prussia. A Presidential Decree of 20th December, 1934, prohibits as from 1st April, 1935 or for some districts 1st April, 1936, the cultivation of potato varieties not immune from wart disease [*Synchytrium endobioticum*: *R.A.M.*, xiii, p. 608]. An exception may be made in the case of establishments entered for annual seed certification. Arrangements for the further application of this regulation will be made in due course.

**Legislative and administrative measures.**—*Int. Bull. Pl. Prot.*, ix, 6, p. 139, 1935.

Peru. A resolution dated 15th December, 1934, declares sugar-cane in the Lambayeque valley of Peru to be infected by mosaic [*R.A.M.*, xi, p. 225], with the result that the extraction and transport of cane cuttings from this region to mosaic-free territories of the Republic is prohibited.